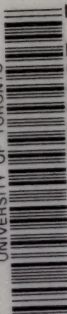
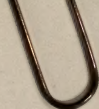


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HOSPITALS AND ASYLUMS
OF
THE WORLD.

VOLUME IV.

HOSPITAL CONSTRUCTION, WITH PLANS
AND BIBLIOGRAPHY.

SELECTED PRESS NOTICES OF VOLUMES I. AND II.

The Times.—"The work cannot fail to be of the utmost interest to all who are practically concerned with hospitals and asylums. . . . Its value as an exhaustive work of reference is indisputable."

The Daily Graphic.—"The first two volumes of the great work upon which Mr. Henry C. Burdett has been so long engaged will be hailed with a hearty welcome as a valuable addition to standard literature. At once solid and popular, the work promises to take a distinct place in the history of philanthropy. Mr. Burdett has had an experience in hospital administration which is practically unrivalled, extending as it does over a quarter of a century."

Pall Mall Gazette.—"The work has been a great undertaking, and contains such a mass of information on the subject of which it treats as has never been brought together before. It is certainly a monument of patient and painstaking industry."

St. James's Gazette.—"The story, traced with scholarly research and succinctly summarised by Mr. Burdett in the opening chapters of his important work on asylums, throws more light on the history of civilisation than a hundred volumes of wars and dynasties. Mr. Burdett's admirable treatise is a mine of exhaustive and accurate information, alike for the statistician and the lunacy expert."

British Medical Journal.—"It has been impossible in this short notice to do justice to the contents of these volumes, which consist of a mass of material of a practical character alike valuable to the architect, the alienist, and the asylum authority. Mr. Burdett has produced a work which is by far the most important and reliable contribution to asylum literature we possess."

New York Medical Journal.—"To those interested in hospital construction the name of this author is well and favourably known, and the scope of the present work will be appreciated by everybody when it is learned that the author has been engaged for the past twelve years in preparing and completing the material for publication—material that represents the experience of twenty-five years as a hospital official in various capacities, and as a visitor to the chief institutions in most European countries, to those in several of the British colonies, and to those in the United States."

Indian Medical Gazette.—"Speaking generally, we consider these two volumes on the asylums of the world to be a monument of patient research and compilation. The reader will find in them not only statistical and other data of practical value, but also much interesting historic lore."

The Saturday Review.—"These two handsome volumes on asylum construction and management do infinite credit to the compiler, the printer, and the publishers. Mr. Burdett's volumes are full of matter which is of the highest interest to everybody."

The National Observer.—"There is no want of asylum literature, but by thoroughness and completeness, by the judicious and scientific treatment of a difficult subject, the appearance of these two volumes is amply justified. They present a nearly perfect picture of things as they are; and when their matter becomes antiquated they will still be valuable as a record and a chart of the world's asylums at the end of the nineteenth century."

Vanity Fair.—"No librarian is justified in being without a copy."

The Edinburgh Scotsman.—"Mr. Henry C. Burdett's new work upon the hospitals and asylums of the world promises to be the most valuable and far-reaching of the many works upon hospital administration that this busy writer has given to the world."

Glasgow Herald.—"We congratulate the author on the termination of his arduous labours, and the eminent success with which he has accomplished this great task of several years' duration."

The Builder.—"We cannot but congratulate the author on the thoroughness with which he has carried out this first portion of what must for years be one of the most comprehensive books of reference on the subject of asylums and hospitals."

The American Architect and Building News.—"The name of Mr. Henry C. Burdett is already very familiar to all who interest themselves in hospital construction or management. It might be too much to say that without him the mass of literature relating to hospitals would never have been systematised and reduced into a form available for English readers, but it is, at least, doubtful whether any one else would have done it so well, and no one could have possibly done the work with more zeal and fidelity."

HOSPITALS AND ASYLUMS

OF

THE WORLD:

*THEIR ORIGIN, HISTORY, CONSTRUCTION, ADMINISTRATION,
MANAGEMENT, AND LEGISLATION;*

WITH PLANS OF THE CHIEF MEDICAL INSTITUTIONS
ACCURATELY DRAWN TO A UNIFORM SCALE,
IN ADDITION TO THOSE OF ALL THE HOSPITALS OF LONDON IN THE
JUBILEE YEAR OF QUEEN VICTORIA'S REIGN.

BY

HENRY C. BURDETT,²

FORMERLY SECRETARY AND GENERAL SUPERINTENDENT OF THE QUEEN'S HOSPITAL, BIRMINGHAM, AND
REGISTRAR OF THE MEDICAL SCHOOL; THE "DREADNOUGHT" SEAMEN'S HOSPITAL, GREENWICH:
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AND UNDER," "THE RELATIVE MORTALITY OF LARGE AND SMALL
HOSPITALS," "HELPS TO HEALTH," "BURDETT'S HOSPITAL
ANNUAL AND YEAR BOOK OF PHILANTHROPY";
AND EDITOR OF "THE HOSPITAL."

IN FOUR VOLUMES AND A PORTFOLIO.

VOLUME IV.

HOSPITAL CONSTRUCTION, WITH PLANS AND BIBLIOGRAPHY.

LONDON:

J. & A. CHURCHILL, 11 NEW BURLINGTON STREET, W.

THE SCIENTIFIC PRESS, 428 STRAND, W.C.

1893.



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INTRODUCTION.



OUR task is now completed. Looking back upon the fourteen years during which this book has been in preparation, and recalling the apparently insurmountable difficulties which have dogged its footsteps from first to last, we must confess to a feeling of thankfulness that, despite all difficulties, it has pleased Providence to enable the work to be finished. Some idea of the pressure of the work itself, owing to the vastness of the ground to be covered, and the immense amount of material which it has been found necessary to examine critically and reduce to order, may be gathered from the circumstance that one of the author's most trusted secretaries, who has seen the mill in operation and realised the frequent and apparently endless succession of obstacles which have had to be overcome, when told that the last sheets of the last volume were ready to go to press, remarked, "Well, I do not mind confessing that I never believed it possible that either of us would live to see this book published."

In the British Colonies, and in the United States of America, a work of this character would never have been undertaken by a private citizen. The State would have found the men and the means to do the work, or it would probably never have been done. In England,

although our American cousins are wont occasionally to speak of the British as an effete nation, works of this character, entailing heavy pecuniary outlay and no pecuniary return, but, on the contrary, much loss, are left to voluntary effort, or they are never published at all. We hope that this frank confession may be pardoned under the special circumstances of the case, and that this book, despite its shortcomings, may, as the years roll by, be found to have marked an epoch in the wise development of medical institutions of every class, and may have resulted in raising the standard of administration, quickening the public interest, and securing the maximum of comfort and a lessening of the sufferings which the sick, and especially the sick poor, have to undergo. Ours has been a labour of love, undertaken because we were called to the work of administering the medical charities in this country at a time when they were far from perfect, and so we have necessarily had to learn what constituted the best possible administration, and how it could be readily introduced and economically carried on. Knowing this, we felt impelled to endeavour to place our special experience and technical knowledge at the disposal of that large army of devoted citizens who, by personal service, render more valuable aid to the medical charities of this country, and of other countries too, than even the wealthiest millionaire could render, be he ever so liberal with his money.

This Volume, the fourth and last, deals mainly, indeed we may say entirely, with matters relating to the construction of hospitals of all kinds. It is therefore necessarily technical, and although medical practitioners, architects, and sanitary engineers will probably value it more for this reason than the lay administrators, we have endeavoured so to arrange the subjects as to make them easily understood by all, whether they have a practical acquaintance with construction or not. It has often happened that we have been consulted because a recently-erected hospital, when opened for the reception of patients, has been found to disappoint the hopes of

those who subscribed the money, and who are responsible for its administration. Mistakes of this kind have occurred in the past, because there has been no means by which the committeemen and medical practitioners, who have been charged with the duty of selecting plans for a new hospital, could make themselves acquainted with everything requisite to secure the best buildings for hospital purposes which modern science and trained experience can produce. For these reasons, we hope that the committees and medical men will study Volume IV. of this book, because we believe that they will find within its pages much information of a practical character, not heretofore available, which must prove of value to all who take an intelligent interest in the well-being of the hospital or kindred institution, with the management of which they may be intimately associated.

The cause of the mistakes exhibited in some of the most recently-erected hospitals, both in the United Kingdom and elsewhere, is not difficult to define. When a new hospital has to be built it is now customary to throw the plans open to limited competition. Immediately such a course has been determined upon, there arises the difficult question of who are the six leading hospital architects. As we have said in Volume II., it is not necessarily, nay, we venture to say it is seldom if at all the case, because a particular architect has built a number of hospitals or kindred institutions, that he is entitled to rank as a leading authority on hospital construction. This very autumn we had to inspect a new hospital, costing many thousands of pounds, where the committee and medical staff had taken infinite pains to secure a type of buildings which should be so good as to make their institution an example for others to follow. We found, however, that the buildings actually erected were a failure, and what is more, a failure of the worst kind ; that is to say, the faults were such as to astonish anyone who had taken the trouble to make himself practically acquainted with modern progress in hospital construction. These

faults were not due to the character of the site, or to any special circumstance, but arose entirely from ignorance, and what we venture to think is worse than ignorance—namely, an attempt on the part of the architect to adopt what he believed, no doubt, to be modern improvements without making himself acquainted with the purposes those improvements were intended to effect. It would not be fair to indicate them, because this would be tantamount to giving the name of the institution, and of those who are responsible. We have no concern with individuals. It is our sole purpose and desire to try and secure that tens of thousands of pounds shall not, in future, be expended upon any group of buildings which are no better adapted to the purposes of a hospital than some which were erected at the beginning of the present century.

How are failures of this kind to be prevented in future? By impressing upon hospital committees and the medical profession the importance of securing the advice at the outset of an expert in these matters, who is thoroughly acquainted with hospital administration and its most recent developments, and to associate with him an architect of eminence. These gentlemen would be able to give the names of a certain number of architects who had built hospitals in recent times which were worthy of imitation. Indeed the portfolio of plans which we issue with this volume will enable any committee to select the best modern hospitals, which they should then inspect, and, having done so, they could ask a certain number of the architects, with whose work they were satisfied, to enter into a limited competition, and to prepare plans for the proposed new hospital.

When the selected plans are sent in under motto, the committee and medical staff are confronted with a new difficulty—who is to determine which is the best plan under all the circumstances for them to adopt? It has been customary for the committee and medical staff to make the selections themselves unaided, or to throw the responsibility upon an eminent architect. The result in more than

one or two recent cases has been, that the best plan sent in has been rejected in favour of one which would never have been accepted could the faults which it contained have been brought home to the minds of the committee. Yet it is hardly fair to throw the blame, in these cases, upon the architect judge, or upon the committee and medical staff, as the case may be, who were entrusted with the duty of making the selection. For, on the one hand, the architect has seldom or never a practical acquaintance with hospital administration, and so is apt to pay too much attention to architectural considerations, as opposed to convenience, modern developments, and sanitation ; and, on the other hand, the committee and medical staff cannot be expected to realise how a particular plan will work out practically, when the buildings it represents are put up and handed over to them for the purposes of a hospital. So, the architects who compete are oppressed with a sense of injustice ; the architect judge is discredited very often in the eyes of some of his profession, and in those of his employers ; and the committee and medical staff are not only disappointed themselves, but they have to bear the indignant criticism of some, at least, of those who have supplied a considerable portion of the money with which the new hospital was built.

In the United States of America a better system prevails. There they refer the plans, and not infrequently the supervision of the buildings during construction, to a hospital expert, who has a sound knowledge of construction, and also of modern hospital administration. This system has produced the Johns Hopkins Hospital at Baltimore, to name one remarkable example, which, taken altogether, is by far the most complete and perfect set of buildings which have ever been erected for hospital use. Dr. John S. Billings, of Washington, the hospital expert to whom we refer, will leave a monument behind him, in the Johns Hopkins Hospital at Baltimore, which would entitle him to the grateful recognition of his countrymen if he had done nothing else—and he has done much

else—in the course of his most useful career. We therefore urge the committees and medical staff to determine, when a new hospital has to be built in future, to call in consultation at the outset a hospital expert like Dr. Billings. This is not an impossible course to recommend, seeing that during the last quarter of a century a few devoted men have given the best of their brains to the subject of hospital administration and hospital construction, and if that experience is not utilised to the advantage of all the hospitals from henceforth, the responsibility must lie upon those who fail to take so reasonable and safe a course as that we here suggest.

Up to this point, we have been dealing with the question of hospital construction from the point of view of medical practitioners, architects, sanitary engineers, and committees of management. Hospital construction presents, however, very many important features well worthy of the consideration of wealthy contributors to hospitals and of the general public. Every year our great cities become more and more congested, as the population continually increases in number. Every year the difficulty of providing sites in suitable situations for great hospitals in cities increases, and yet the site is, on the whole, probably the most important of the many factors which collectively constitute what we include in the phrase "hospital construction." Let us take, by way of illustration, the condition of the London hospitals in regard to sites at the present time. It will be seen, as we proceed, that, collectively, these sites represent the best and worst features which can attach to hospitals in densely crowded neighbourhoods. The thing to aim at is to have a site of sufficient area to provide at least 300 superficial feet per bed. The site should be self-contained; that is to say, it should be so chosen as to enable the authorities to prevent the hospital from being deprived of light and air by contiguous buildings. To ensure this result it is desirable that the hospital site should be entirely surrounded by streets of a reasonable width.

The largest hospital, and one of the oldest, in the Metropolis is the "London," situated in the Whitechapel Road, a description of which will be found in this book, and a plan in the portfolio which accompanies it. The site of the London Hospital is self-contained, as the following plan will show. It is entirely surrounded by streets; it has ample grass and garden space within its area; it consists of 240,327 ft., or 310 ft. of site area for each of the 776 beds it contains. The garden and grass plots are essential to the well-being of a hospital in a large town, because they not only secure to the patients the requisite light and free circulation of air, but they enable the resident staff to have an amount of exercise which is essential to their health, and consequently to the well-being of the whole establishment.

Next in size among metropolitan hospitals is St. Bartholomew's, situated in Smithfield, E.C. The total site area is 203,690 ft., which provides a site area of 271 ft. for each of the 748 beds it contains. St. Bartholomew's is a much older hospital than the London, and, on the whole, it is right to say that, though the site is fairly adequate, it would have been better had its area been considerably greater than it is at present. We believe that the

THE LONDON HOSPITAL
WHITECHAPEL ROAD.



ST BARTHOLOMEWS HOSPITAL
SMITHFIELD, LONDON, E.C.



Governors have purchased, or intend to purchase, a portion of the site hitherto occupied by Christ's Hospital, which adjoins their property. We hope that they will purchase enough to increase the site area per bed to at least 310 ft. and so to supply adequate recreation grounds for the staff, as well as increased air and light space. As a matter of planning, the four ward blocks are unique in arrangement. They occupy the sides of a hollow square, but—and this is important—the buildings on each of the four sides are self-contained, and entirely separated each from the others, and are so arranged as to cause the free circulation of air round each block, and throughout the hollow square also. Having studied the planning of hundreds of hospitals, and recalling the fact that the separate pavilion type is now recognised as being the best for hospital purposes, we cannot but record our admiration of the foresight and ability of the architect who originally planned St. Bartholomew's Hospital. Although St. Bartholomew's constitutes in itself a separate parish, and is thus able to free itself from poor-rates, it is hemmed in on two sides by blocks of buildings which interfere with the free circulation of air, and which should, if possible, be bought up to a sufficient extent to enable the authorities, with the aid of the City Corporation, to enclose the hospital site by adding new streets on the west and south sides. It is true that the outer boundary of the west side of the site is occupied almost entirely by the medical school buildings, and that on the south side, where there are buildings within the hospital area, they are not occupied by patients. Still the medical school buildings are too closely contiguous to the west wards, and the south wards would be immensely improved if the buildings behind them could be demolished so as to let in more sunlight and air.

The site of Guy's Hospital, in St. Thomas's Street, Borough, S.E., is fairly satisfactory, and includes an open space known as "The Park," which has proved most beneficial to the patients, especially during the summer months. Generally the wards

are protected from the risks attaching to contiguous buildings; and although the drainage, owing to the age of the hospital buildings, is imperfect, in the sense that there are believed to be a number of old drains in existence of which no plan is forthcoming, still the results of treatment are, on the whole, satisfactory. The total site area is 237,103 ft., which provides a site area of 395 ft. for each of the 600 beds contained in the buildings.

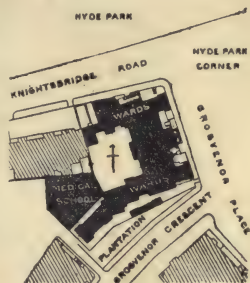
St. George's Hospital, at Hyde Park Corner, occupies one of the finest public sites in London. It is believed, however, that the finances of the institution suffer from this circumstance, because many wealthy people who so frequently pass it during the season, instead of being attracted to its support, console themselves with the reflection that a hospital so well placed, and so constantly before the public eye, must necessarily have more money than it knows what to do with. We mention this fact as a gentle hint to those immediately concerned, and by way of consolation to the managers of other hospitals, situated in poor neighbourhoods which are seldom or never seen by the wealthy. On three out of four sides, St. George's Hospital abuts on streets; and on a portion of the western side there are contiguous buildings, which it would be better to demolish sufficiently to enable the site to be made entirely self-contained. The total

GUY'S HOSPITAL, LONDON, S.E.



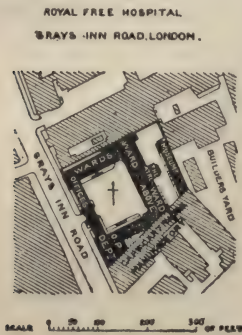
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ST. GEORGE'S HOSPITAL, LONDON.



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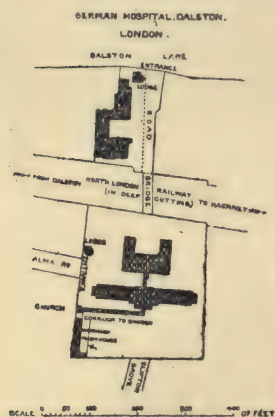
largely of old buildings reconstructed and converted to hospital purposes. The site is fairly large, but it is too much shut in by



contiguous buildings at the present time, and steps should be taken, if opportunity offers, to acquire additions to the site on the three sides to which this criticism applies. The total site area is 40,455 ft., which gives a site area of 253 ft. for each bed. This allowance is fairly liberal, owing to the circumstance that the wards are built round a hollow square, and to a moderate-sized piece of unoccupied site at the back between the wards and the Museum buildings.

The sites of all the foregoing institutions may be regarded as reasonably satisfactory for town hospitals. There are three large general hospitals in London, however, which have

extensive sites, two of them being magnificent. The first of these is St. Thomas's Hospital, situated on the Albert Embankment, opposite the House of Commons. It has on one side the River Thames throughout its whole length, and on the opposite side, the Palace Road, Lambeth. The treasurer's house and the administrative buildings face Westminster Bridge Road. Nothing could well be better than a site like this for a town hospital, except perhaps that its contiguity to the river may subject the wards to influences at certain seasons of the year which were best avoided. It has been much criticised as being far too costly a site for such a building, but the situation is convenient enough for the large population which the hospital is intended to serve. The total site area is 373,042 ft., which gives an area of 652 ft. for each of the 572 beds contained in the buildings. The site area is consequently quite double the size which is necessary for hygienic purposes.



The German Hospital at Dalston, N.E., where land is presumably relatively cheap, occupies a very large area. It consists of two portions, one on each side of the North London Railway, connected by a bridge, as shown in the plan. This fact has led, no doubt, to more space being appropriated to the hospital than would otherwise have been the case. The total site area is 101,990 ft., which gives an area of 718 ft. to each of the 142 beds which the institution contains.

The site of the Seamen's Hospital at Greenwich forms a portion of the grounds originally set apart for Greenwich Hospital. It is an ideal site for a town hospital, and, though the buildings are old, and of the corridor type, the results of treatment are stated to be satisfactory. It was formerly the Infirmary of Greenwich Hospital, and was handed over to the Seamen's Hospital Society, when

Greenwich Hospital was closed, to take the place of the "Dreadnought" Hospital Ship, which used formerly to be moored off Greenwich. The total site area is 119,700 ft., giving an area of 500 ft. to each of the 239 beds the buildings contain.

We have been dealing previously with the sites of those metropolitan hospitals which may be regarded—with two exceptions—as reasonably or entirely satisfactory. We have finally to call attention, by way of illustration, to two hospitals (the Middlesex and St. Mary's Hospitals), the sites of which are, or are in process of becoming, satisfactory ; to one (the Great Northern Central), where a successful effort has been made to neutralise the effects of a bad site by a novel departure in construction ; and to two others (the Charing Cross and University College Hospitals), the sites of which afford an excellent opening for a millionaire to do a great public service by coming to the rescue of the committees under most trying and difficult circumstances. Taking them in order, we propose to give the plans of the sites of the Middlesex and St. Mary's, as illustrating what can be done to improve a town site originally defective ; a plan of the Great Northern Central Hospital site to illustrate how modern methods of construction are able to neutralise elements of danger from contiguous buildings ; and a plan of the sites of the Charing Cross and University College Hospitals, to prove how necessary it is that public authorities and private owners should afford facilities for hospital managers to purchase contiguous buildings for the purposes of an institution devoted to the treatment of the sick.

The site of Middlesex Hospital, Mortimer Street, W., at one period of its history resembled that of University College Hospital to-day. It had a number of contiguous buildings, which limited the site area, and were objectionable for other reasons. Bit by bit, the managers of the Middlesex Hospital have bought up the land and houses within an area surrounded by streets, until, as the plan shows, they have succeeded in acquiring the whole of a self-

contained site, with the exception of one small portion. The new buildings which have been put up in recent years in connection with this hospital have been designed with much skill, and the considerable space of open ground between the hospital proper and the Medical School buildings is found most valuable, as at Guy's and the London, during several months in the year. The total site area is 81,947 ft., which gives an area of 267 ft. to each of the 307 beds which the institution contains.



Until the last twelve months, the site occupied by St. Mary's Hospital, Paddington, W., was shut out from the main thoroughfare—Praed Street—by a number of miserable tenements, which prevented the hospital buildings from being seen, and were also objectionable for other reasons. The committee have at length been able to buy up the whole of these buildings and the site upon which they stood. On December 17, 1892, H.R.H. the Prince of Wales laid the foundation stone of the further and final extension of this valuable hospital, which will bring it prominently under public notice, and secure that the site occupied shall be self-contained. The old site area was 38,280 ft., which gave an area of only 136 ft. to each of the 281 beds the buildings contain. The additional site now acquired will increase the area per bed, which, however,

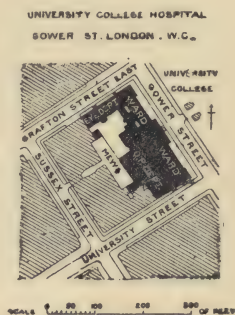
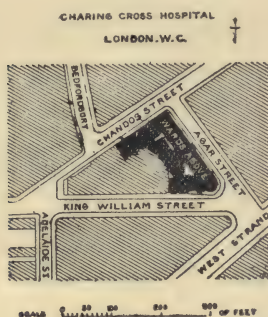
like St. George's Hospital, is never likely to even approach 200 feet.

The site of the Great Northern Central Hospital, in the Holloway Road, leaves much to be desired. The hospital has been placed where it now stands to meet the demand of the inhabitants of North London to have a hospital erected in a position which would give the patients ready facility of access. Upwards of two years was taken up with the endeavour to find a suitable site in this congested district, and the present one is the best that could be obtained. It will be seen, that although the buildings face the Holloway Road, the site is peculiar in shape, and surrounded by buildings of various kinds. To minimise the evils likely to arise, it was determined to erect one pavilion of circular wards, and one of rectangular wards. The site, from its special peculiarities, naturally favoured this kind of construction, and the interest which this hospital is likely to excite when completed must be considerable. The circular and rectangular wards will respectively contain the same number of superficial and cubic feet per bed, and the whole of the buildings have been so constructed as to promote a careful comparison of the results of treatment in the circular and rectangular wards respectively. We shall soon learn, therefore, how far, if at all, the shape of a ward in a town hospital contributes to successful treatment. The total site area is 44,719 ft., which will give an area of about 300 ft. to each of the 150 beds which the buildings will ultimately contain.



The site of Charing Cross Hospital, Agar Street, W.C., is excellent, so far as the needs of the neighbourhood in which it is situated are concerned, but, in other respects, it leaves something to be desired. It will be noticed that there is a triangular space

facing King William Street and Chandos Street respectively at the back of the present hospital, which is occupied by buildings not under the control of the hospital authorities. It would be most desirable to enable the committee to buy out the existing owners, and to add the whole of this land to the site. Of course it would take a great deal of money to accomplish this, but, having regard to the importance of the situation, and to the good work done by the hospital, we hope that one or more wealthy men will step in and present the land to Charing Cross Hospital. The importance of this step will impress the intelligent reader when we point out that the present site area per bed is only 86 ft.; in other words, the 175 beds have collectively a site area of only 15,150 ft.



Unfortunate as are the circumstances attaching to Charing Cross Hospital, so far as the site is concerned, the case of University College Hospital, Gower Street, W.C., is, in all the circumstances, far worse. It will be seen from the plan that the present hospital buildings face Gower Street, having Grafton Street on the east and University Street on the west side. Sussex Street cuts Grafton Street and University Street at a right angle at the rear of the hospital, and between Sussex Street and the hospital site there is an area of about 30,000 ft. at present occupied by buildings of various kinds, unconnected with the hospital. Having regard to the large school attached to University College, and to the importance of having a hospital connected with it, which shall be replete with

every modern improvement, whilst providing at least 400 beds, it is lamentable to realise that all the efforts of the committee have failed to acquire more than a portion of the 30,000 additional feet at the back of the present site. Will not some wealthy man step in, and, if the legal and other difficulties prove too great to be overcome in any other way, will he not bear the expense of promoting a Bill to acquire those portions of the 30,000 ft. referred to, and hand them over as a free gift to the hospital authorities? This would enable the present inadequate buildings to be pulled down, the whole site to be acquired, and a splendid hospital to be erected thereon, worthy of the great medical school to which it would be attached, and adequate to meet the requirements of the many poor people who need hospital care in this crowded district of London. The total site area at present is 25,526 ft., which gives an area of 123 ft. to each of the 207 beds which the institution at present contains.

We have already in the preface to the third volume expressed our indebtedness to the many willing helpers who have rendered invaluable aid in the production of this book. It is therefore unnecessary for us to repeat our acknowledgments in this place. We hope, however, that the termination of our enterprise, which culminates in the publication of the present volume, will prove helpful and encouraging in many ways to the large army of devoted men and women who spend so much of their time and substance in an endeavour to alleviate the suffering of the sick and injured poor who flock to the hospitals everywhere. Statistics prove that the enormous development and improvements which have taken place of late years in hospital construction have tended not only to diminish suffering, but to prolong life. We are emboldened to hope that the results of the exhaustive inquiries which have occupied our hours of leisure during the last fourteen years, may, in many ways, tend to yet further improve and extend the advantages which a well-found hospital is able to confer upon large masses of the population, whom it has pleased Providence to so afflict as

to render them incapable of providing for themselves in the hour of their sorest need. If this hope be in a measure fulfilled, our labour will not have been in vain, and we shall reap a reward out of all proportion to the work, arduous and difficult as it has undoubtedly been, which we have had the privilege of bringing to a successful termination.



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Errata.

Page 322, sixth line from top, for "Artificial" read "Superficial."

Page xviii of Introduction, and in portfolio, on block plan of Middlesex Hospital, for "Charles Street" read "Mortimer Street."

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LIST OF PLANS

IN THE

PORTFOLIO

GENERAL HOSPITALS.

CLASS 1.—PAVILION HOSPITALS.

SUB-CLASS 1A.—The Single Pavilion or straight plan, i.e., two pavilions placed end to end with the administration interposed.

	SHEET
THE UNITED KINGDOM :	
German Hospital, Dalston, London	1
Cumberland Infirmary, Carlisle	1
Addenbrooke's Hospital, Cambridge	2
Royal Hants County Hospital, Winchester	3
West Bromwich District Hospital	3

UNITED STATES OF AMERICA :

Michael Reese Jewish Hospital, Chicago, Ill.	4
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SUB-CLASS 1B.—The Double Pavilion, i.e., two pavilions joined together by a corridor, in the centre of which the administration is placed.

THE UNITED KINGDOM :

London Temperance Hospital, Hampstead Road, London, N.W.	5
Royal Infirmary, Preston	5
Swansea Hospital	6
Swansea Eye Hospital	7

GERMAN EMPIRE :

The Augusta Hospital, Berlin	8
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	SHEET
PERSIA :	
Teheran Hospital	9
SPAIN :	
Rio Tinto Mine Hospital, near Huelva	10
UNITED STATES OF AMERICA :	
Mary Hitchcock Memorial Hospital, Hanover, N.H.	11
St. Luke's Free Hospital, Chicago, Ill.	11
 SUB-CLASS IC.—The Multiple Pavilion, i.e., a number of pavilions arranged either on one or both sides of a corridor.	
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Royal Albert Edward Infirmary, Wigan	12
St. Thomas's Hospital, Albert Embankment, London	13
Derbyshire Royal Infirmary, Derby—Ground Floor	14
" " " "—First Floor	15
Royal Infirmary, Edinburgh	16
FRANCE :	
Civil and Military Hospital, Montpellier	17
GERMAN EMPIRE :	
The Urban Hospital, Berlin	18
SWEDEN :	
Sabbatsberg Hospital, Stockholm	19
UNITED STATES OF AMERICA :	
The Moses Taylor Hospital, Scranton, Pennsylvania	20
AUSTRALIA :	
Prince Alfred Hospital, Sydney, New South Wales	21

SUB-CLASS ID.—Circular Wards.

THE UNITED KINGDOM :	
East Sussex, Hastings and St. Leonards Hospital, Hastings	22
Victoria Hospital, Burnley	22
BELGIUM :	
Civil Hospital, Antwerp	23, 24

SUB-CLASS IE.—A combination of both Circular and Rectangular Wards.

THE UNITED KINGDOM :	
Great Northern Central Hospital, Holloway Road, London, N.	25
The Royal Infirmary, Liverpool—Ground Floor	26
" " " "—First Floor	27

SUB-CLASS 1F.—Isolated Pavilions, i.e., with no connecting corridor.

SHEET

FRANCE :

Municipal Hospital, St. Denis, near Paris . . . 28

GERMAN EMPIRE :

Municipal Hospital, Friedrichshain, Berlin . . . 29

City "Barrack Lazareth," Moabit, Berlin . . . 29

The New General Hospital at Eppendorf, Hamburg . . . 30

The University Hospital, Halle . . . 31

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UNITED STATES OF AMERICA :

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SUB-CLASS 2B.—Two Blocks in the form of an L.

THE UNITED KINGDOM :

Royal South Hants Infirmary, Southampton . . . 35

SUB-CLASS 2C.—Three Blocks arranged as a rectangular U.

THE UNITED KINGDOM :

The London Hospital, Whitechapel Road, London, E. . . 36

Charing Cross Hospital, London, W.C. . . 37

University College Hospital, Gower Street, London, W.C. . . 37

Royal Infirmary, Newcastle-on-Tyne . . . 38

SUB-CLASS 2D.—Three Blocks arranged as an H.

THE UNITED KINGDOM :

St. George's Hospital, Hyde Park Corner, London, S.W. . . 39

Middlesex Hospital, Mortimer Street, London, W. . . 40

Norfolk and Norwich Hospital, Norwich . . . 41

Infirmary, Leicester . . . 42

SUB-CLASS 2E.—Four Blocks arranged round a quadrangle and connected together at the angles.**THE UNITED KINGDOM :**

SHEET

King's College Hospital, London, W.C.	43
Royal Free Hospital, Gray's Inn Road, London, W.C.	43

SUB-CLASS 2F.—A single straight Block.**THE UNITED KINGDOM :**

Northern Infirmary, Inverness	44
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CLASS 3.—CORRIDOR HOSPITALS.**SUB-CLASS 3A.—Single Corridor, where the wards are on one side only of the corridor, the other side being open to the air.****THE UNITED KINGDOM :**

Royal Infirmary, Dundee	45
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HOLLAND :

Hospital on the Coolsingel, Rotterdam	46
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SUB-CLASS 3B.—Double Corridor, where the wards are placed on each side of the corridor.**THE UNITED KINGDOM :**

The Seamen's Hospital, Greenwich	47
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Sir Jamsetjee Jeejeebhoy Hospital, Bombay	57
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North-Eastern Hospital for Children, Goldsmith's Place, Hackney Road, E.	61
The Evelina Hospital for Children, Southwark Bridge Road, S.E.	62
Cheyne Hospital for Children, Cheyne Walk, Chelsea	62
Paddington Green Children's Hospital, W.	62
Royal Hospital for Children and Women, Waterloo Road, S.E.	62

PROVINCIAL—ENGLAND :

Hospital for Sick Children, Pendlebury, Manchester	63
Fleming Memorial Hospital for Sick Children, Newcastle-on-Tyne	64
Children's Hospital, Bradford	64

RUSSIA :

St. Olga's Hospital for Children, Moscow	65
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SWITZERLAND :

Children's Hospital, Basel	66
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2.—CONSUMPTION AND CHEST DISEASES.

SHEET

LONDON :

Hospital for Consumption and Diseases of the Chest, Brompton, S.W.	67
Hospital for Diseases of the Chest, Victoria Park	68
North London Hospital for Consumption, Mount Vernon, Hampstead	68
Royal Hospital for Diseases of the Chest, City Road, E.C.	68

PROVINCIAL—ENGLAND :

Royal National Hospital for Consumption and Diseases of the Chest, Ventnor, Undercliff, Isle of Wight	69
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3.—CHRONIC.**PROVINCIAL—ENGLAND :**

The Jaffray Suburban Hospital, Birmingham	70
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4.—INFECTIOUS DISEASES.**LONDON :**

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CHAPTER I.

CLIMATE IN RELATION TO HOSPITAL CONSTRUCTION.

TO what extent do differences in climate make necessary, or desirable, corresponding differences in plan or construction of hospitals? It is not an easy matter to answer this question, because it is difficult to separate the influence which the habits and customs of different localities exert upon their modes of hospital construction from that which is due to differences in temperature, moisture, &c., which make up the sum of what we call climate. In hot climates shade and coolness are most desired during a large part of the year, while in the extreme north it is just the reverse, light and warmth having there to be carefully provided for. But more than the mere differences of temperature as shown by meteorological records must be taken into consideration in deciding whether certain plans and specifications for a hospital which have given good results in one country will prove equally satisfactory in another. For example, as is stated in the section on heating and ventilation, higher temperatures are demanded in hospitals in the northern part of the United States than are required in England, partly because in the former locality the climate is drier, and partly because the people there are accustomed to have their houses and hotels heated to a higher temperature than is considered agreeable or healthy in England. The extreme ranges of temperature during the year must be considered as well as the annual mean. Fortunately, some of the features of construction which are specially desirable to prevent loss of heat in cold weather, are also useful to preserve coolness when the external air is overheated. Thick double walls

enclosing a non-conducting sheet of air are desirable both in the tropics and in the arctic regions ; it is only in the moderately warm and almost uniform climates of such localities as Southern California or Japan that thin walls and a comparatively slight construction may be not only permitted, but even advised. It is easier to provide against great cold than against long-continued excessive heat.

For hospitals to be located in cold climates, where the temperature is liable to be near the freezing point for several months in the year, and to sink below zero (Fahr.) several times in the course of a winter, double walls and double windows, abundance of radiating surface in the heating apparatus, the complete enclosure of the basement or space beneath the lowest ward floor, and the placing of all water and soil pipes in positions where they will not be exposed to the danger of freezing, are points which must be kept constantly in view. In such localities the complete separation of the ward buildings from those devoted to administration, and especially from the kitchen, is not desirable, and therefore covered corridors connecting the wards become almost a necessity.

In warm climates the buildings may be more widely separated, and open verandahs may properly be made a marked feature in the plans of the wards, which may be built on open arches or supported on piers rising six feet or more above the ground.

The means which are practically at our command to reduce the temperature of hospital wards during extreme hot weather are very limited. Something may be done by the use of mechanical means to keep the air in motion, such as the large swinging fans or punkahs employed in India. If the air is sufficiently dry, the evaporation of water from wetted screens will somewhat mitigate the excessive heat.

It has been proposed to obtain cool air in summer and warm air in winter from caves, tunnels, or dry wells, thus taking advantage of the fact that at moderate depths the temperature of the earth is substantially uniform throughout the year ; and in his work on the British Army in India, published in 1858, Dr. Jeffreys mentions that in 1824 an attempt was made to supply with cool air a large hospital at Cawnpore by means of a long underground tunnel, but the attempt was a failure because the cooling surface was insufficient.

In malarious regions, the higher the ward can be placed above the surface of the earth the better, and for this reason for small

twelve-bed post hospitals in the United States a model plan provides for placing the ward in the second storey and keeping the rooms for administration below.

In English hospitals it is desirable to secure as much sunshine as possible in the wards, and for this reason the long axis of the pavilions is usually placed nearly north and south ; but in countries nearer the equator this rule of orientation is less regarded, and it is considered more important that the wards should be so placed that the prevailing winds during the warm months shall sweep through them from side to side.





CHAPTER II.

CONSTRUCTION.

SITE.—(*a*) *aspect and conformation of ground* ; (*β*) *nature of soil* ; (*γ*) *area in relation to number of beds* ; (*δ*) *convenience of access for patients, medical staff and students* ; (*ε*) *cost*.

FOUNDATIONS.—*Construction—Open basements.*

WALLS.—*Function of an enclosing wall—Relative porosity of bricks and stones—Wall surfaces for wards.*

FLOORS AND FLOOR SURFACES.—*Fireproof construction—Special requirements forwards—Rounded angles—Out-patient department—Mortuary—Corridors.*

JOINERS' WORK GENERALLY.—*Avoidance of mouldings—Advantages of double glazing to windows—Doors in wards and bath-rooms.*

SITE.

THE chief considerations to be held in view in choosing a site for a hospital are (*a*) aspect and conformation of ground ; (*β*) nature of soil ; (*γ*) area in relation to number of beds ; (*δ*) convenience of access for patients, medical staff and students ; and (*ε*) cost. The first three are questions of hygiene, the last two of economy ; and the tendency to subordinate the health considerations to those of economy is too often in the ascendant.

(*a*) *Aspect and conformation of ground.* Aspect must be considered not only in relation to access of sunlight, but to prevailing winds and their healthiness or the reverse. Speaking broadly, in this country a south or south-west aspect is generally the one most to be desired ; but, in the tropics especially, it is of the greatest importance to guard against exposure to certain winds

which are laden with disease-bearing organisms. Thus while, as a general rule, a site well elevated above the surrounding country might be regarded as a healthy one, it would be exactly the reverse if it were exposed to winds blowing over marshes of a malarious nature. Assuming, however, that no unhealthy conditions of this kind exist, the primary consideration as regards aspect is to attain the freest possible access of sunlight to all parts of the ground. The conformation of the ground is a point of great importance; enclosed valleys, the feet of hills, or low-lying ground which receives the drainage from the surrounding land, are all unsuitable sites for any kind of habitation. In this country the most healthy site would be on land well elevated and sloping gently towards the south or south-west. It should be protected from the north and east winds; and the slope of the ground should not be steep, as a sharp inclination causes stagnation of air.

(β) *Nature of Soil.* The healthiness or unhealthiness of a particular soil is affected by its power of retaining heat, and by the level of the ground water. It is also affected by the actual composition of the ground itself, if this is what is usually known as "made earth." The power of retaining heat affects the temperature of a soil to a very marked degree; thin clay and chalk absorb heat to a very much less degree than sand; hence the two former are much colder soils than the latter. Vegetation greatly lessens the absorbent power of a soil and increases the radiation.

There is in all soils a certain point at which water is met with, and the depth at which this occurs is called the ground water-level. The quantity of moisture retained in the ground varies very greatly in different kinds of soil; thus, chalk will absorb 13 to 17 per cent., clay 20 per cent., and humus 40 to 60 per cent. of its weight of water.* The term "ground water" is defined by Pettenkofer to mean that condition in which all the interstices in the soil are completely filled with water. The depth at which this sheet of water lies below the surface of the ground varies in different soils from a few feet to some hundreds, and is in constant movement towards the nearest natural outlet. The water-level may either be almost permanent, varying only a few inches during the year, or it may rise and fall through a distance of several feet. Its influence on the health of a district is governed partly by its depth below the surface, but mainly by the amount of variation in level to which it

* Parkes.

is subject. A high water-level is unhealthy, because it keeps the soil and the air above moist and damp. This is a matter which can be cured by drainage; and the researches of Dr. Buchanan in England and of Dr. Bowditch in America illustrate very clearly the relation between the drainage of districts in which phthisis had been prevalent and the consequent diminution in the number of deaths from that disease. The inter-spaces in the soil above the water-level are filled with air. To so great an extent is this the case that the quantity of air contained in even a very compact gravel amounts to one-third of its bulk.* The more porous, therefore, the soil, the greater the amount of air it contains. The air thus enclosed is, however, by no means stationary; it is more or less in constant movement and is subject to the influence of atmospheric pressure; it is also, unless proper precautions are adopted, liable to be drawn up into a house by the upward current induced by the warmer air of the house. Air sucked up in this way would be impregnated largely with decaying organic matter when the ground water-level was low, and would be saturated with moisture when it was high, both of which conditions are highly antagonistic to health.

The composition of the soil itself may, in addition to its properties of retaining heat and moisture to a greater or less degree, injuriously affect the health of those living on it. In most large towns a large proportion of the subsoil consists of accumulations of refuse of all kinds, resulting generally from inequalities in the ground having been filled in with the contents of local dust-bins. Such a soil is obviously an improper one on which to build, unless the earth is covered with an impervious stratum of concrete or asphalt, or some other equally efficacious pavement. This precaution is equally necessary in the purest possible soils in order to prevent the air from the ground being drawn into the houses erected thereon. "In some malarious districts great benefit has been obtained by covering the ground with grass, and thus hindering the ascent of the miasm." (Parkes.)

(γ) *Area in relation to number of inmates.* The relation of area of site to the number of beds is a subject upon which the practice in England and abroad varies very greatly. Intimately connected with this subject is the question as to the number of stories admissible in the ward buildings. As an example of the way in which practice varies, the following figures (quoted from Table

* T. W. Hime.

No. I. in Mouat and Snell's "Hospital Construction and Management") may be adduced :—

					Sq. feet
Ehrenbreitstein Military Hospital—area of					
site per bed ...	...	...	...	...	365
Dresden (new pavilions)	...	...	...	...	3,297

Leaving out of account the Poor-law infirmaries as not being hospitals for acute diseases only, these two examples show the highest and lowest areas respectively in the list from which they are taken.

The practice of allowing only one-storey buildings for the wards is one which has been much followed of late years both in France and in Germany ; and there is much to be said in its favour, particularly when, as in the Charité and the Moabit Hospitals at Berlin, all diseases except mental are treated in one hospital. These one-storeyed pavilions are all detached, and become in fact a series of separate hospitals governed by one administrative body. Such an arrangement is, however, clearly impossible in large towns where land within a reasonable distance is too valuable to admit of so large an area being utilised. Nor can it be said that hospital experience in this country at all warrants the conclusion that wards superposed one upon another in two, three, or even four storeys are, *per se*, unhealthy. What is really important to the well-being of a hospital is that all round it there should be a free open space of sufficient width in proportion to the height of its buildings ; and it may be taken as a fair rule that the distance between any two ward pavilions, or between a ward pavilion and the nearest building, should be at least double the height of the higher building. In addition to this, every general hospital ought to be provided with some means of taking patients into the open air. For this purpose a garden such as those belonging to Guy's and the Middlesex Hospitals is of course the best ; but failing this, large covered balconies similar to those at the Berlin Civil Hospital, or flat roofs, give the desired accommodation.

It is difficult to lay down any definite rule for the proportion to be observed between the area of site and the number of beds for general hospitals, especially as the proportion must necessarily vary with the total number of beds to be provided. The just mean lies probably about midway between the two extremes quoted above ; or from about 1,000 square feet to 1,800 square feet per bed. Antwerp Civil Hospital (380 beds) with 1,126 square feet, and the Johns

8 *Hospitals and Asylums of the World.—Hospitals.*

Hopkins Hospital, Baltimore, United States of America (361 beds), with 1,679 square feet per bed, may be taken as affording excellent examples of well-arranged hospitals on ample sites.

For fever and smallpox hospitals it is possible to arrive at a more definite estimate of the amount of land required. In both these classes of hospitals a sufficiency of space for exercising ground for convalescent patients is an indispensable necessity; and in addition to this there should always be, surrounding any hospital for the treatment of infectious diseases, a neutral zone or *cordon sanitaire* to cut off all chance of communication between the patients and the outer world. The limit recommended by Dr. Thorne Thorne, in his report on the "Use and Influence of Hospitals for Infectious Diseases" (published as a supplement to the tenth annual report of the Local Government Board, 1880-81), is one acre to twenty patients; and it will be found that, in properly arranged hospitals, if more than one disease is to be provided for, this limit must never be reduced, but will, in small hospitals, frequently have to be exceeded.

(8) *Convenience of access* for patients, medical staff, and students. Inasmuch as the primary object of a hospital is the treatment of disease, the first object for consideration in fixing upon a site should be convenience of access for the people for whose benefit the hospital exists. Dr. Oppert, writing on the subject of hospital accommodation, says, that for every 1,000 inhabitants there ought to be four beds for the sick poor; and fixes the total accommodation for London at 16,000 beds. On this basis he suggests that a hospital for 400 beds would amply suffice for a population of 100,000; and that for such a population distributed over a large area the hospital would not be inconveniently situated if not placed in the exact centre. If the area be larger, he says, the sick poor who live farthest away will experience some difficulty in getting to the hospital. (Oppert, "Hospitals, Infirmarys and Dispensaries," 1883.) If these figures are compared with some relating to the London hospitals, it will readily be seen how very unequally the hospital accommodation of London is distributed. Taking Charing Cross as a centre, it will be found that a circle having a radius of three miles includes within its circumference all the principal hospitals of London. "In seven miles beyond this, to which the registration area extends, there are barely a dozen hospitals, none of them of any magnitude or importance." (Mouat, "Organisation of Medical Relief in the Metropolis.")

The registration district of Lewisham, which is for the most part a thickly populated area including some very poor neighbourhoods and has a population of 73,314, has within it only one hospital, and that a special hospital with thirty-three beds for women (Mouat, *op. cit.*).

Assuming that Dr. Oppert's limit of 400 beds to a population of 100,000 persons is correct, it would appear that the precise position of the hospital, so long as it is within the area to be served, is of little moment to the patients. It may then be fairly considered what is the most convenient position for the medical staff, and the situation may be regulated accordingly.

(ε) *Cost.* This is not a question which can properly be discussed here, but it is one which enters very largely into considerations affecting the choice of a hospital site.

FOUNDATIONS, WALLS AND FLOORS ; JOINERS' WORK.

Foundations.—The precautions necessary to ensure a stable foundation to a hospital building belong to the science of building, and the subject does not present any special features applicable only to hospitals. The importance of providing sufficiently strong foundations to prevent all possibility of failure in the superstructure cannot be exaggerated ; and of equal importance is it to prevent the moisture in the soil being drawn up into the walls by capillary attraction. The method of preventing the last-mentioned evil is to interpose between the level of the ground and that of the lowest floor a layer of asphalt, or slates, or other impervious substance, continuously along the whole length and width of the wall.

In several recently built hospitals abroad, the lower or ground floor of the ward pavilions is raised above the level of the surrounding ground to a height varying from about three feet (Halle University Hospital) to about seven feet (Saint Eloi, Montpellier, France), and the space thus formed is left, or intended to be left, open for the free passage of air from side to side. The object of this arrangement is to raise the wards above the level of the ground, and so ensure that the air which enters the windows shall not be in close contact with the earth and the emanations therefrom ; and also to prevent the stagnation of the air in the angle formed by the upright walls and the earth.

Walls.—The proper function of an enclosing wall to a building is usually assumed to be (in addition to its duties of support) to

keep out the air. In reality, a wall which has been built in the ordinary way of brick or stone and plastered internally, performs this function only to a limited extent. The porosity of brick is very great, whilst that of stone is less and varies considerably according to the nature of the stone. The porosity of ordinary plaster can best be appreciated by observing the effect of time on a plastered ceiling, particularly one immediately under a roof. It will be seen that all the spaces between the joists are marked out by broad black bands, the width of the joists being clearly marked by narrower bands of much lighter colour. The explanation of this is that the air passes freely up through the plaster between the joists and leaves the dirt behind, while where the joists occur there is no free passage through the plaster and consequently no attraction of air.

The relative porosity of different kinds of building stones and bricks is expressed by their capacity for absorbing moisture. The following figures are extracted from a table given in "Notes on Building Construction":—

Stones—Granites	...	...	...	$\frac{1}{2}$ to 1	per cent.
Sandstones	...	...	...	8 to 20	" "
Limestones	...	...	...	$1\frac{1}{3}$ to 17	" "
Bricks	...	...	...	23 to 22	" "

The most absorbent sandstone is "Hassock" of very bad quality: the most absorbent limestone, is Ancaster; and after marble, which can hardly be said to be porous at all, the least absorbent is Kentish Rag. The most absorbent bricks are those known as malms, and the least absorbent are Staffordshire blue bricks.

It is evident, therefore, that a very large quantity of air passes to and fro through the external walls of a house, and that the walls will act as a filter by intercepting the organic particles carried on the air currents. In a hospital, therefore, it would seem that the internal lining of the walls, if it is of a porous nature, must become saturated with the matter floating in the air, and such matter will in the parts occupied by patients be very largely composed of organic particles, epithelium, pus-cells, and the like. "In a discussion, in 1862, in the French Academy of Medicine, a case was mentioned in which an analysis had been made of the plaster of a hospital wall, and 46 per cent. of organic matter was found in the plaster." (Galton, "Healthy Dwellings.")

This being the case, it would seem that the most perfect form of wall for a hospital ward is one which presents an absolutely

impervious surface capable of being washed down and thoroughly cleansed without its impermeability being affected. Such a wall as this, if it could be obtained, would have the effect of condensing on its surface the moisture carried by the air, and so of lowering the temperature of the ward. To remedy this a larger supply of air would be necessary than would be the case with walls of the ordinary construction ; or, as has been suggested (Galton, *op. cit.*), an interspace might be formed between the inside enamelled and impervious wall and the outer wall, and the air of the interspace be warmed before admitting it to the ward. The problem, however, of how to obtain an impervious wall has yet to be solved ; and probably the best mode of treating a wall surface yet devised is by paper and varnish. A wall finished in this way is, if the work be done thoroughly and well, to all intents and purposes impervious ; it is not, however, by any means everlasting, and it requires to be carefully examined from time to time in order to detect the presence of cracks in the surface of the varnish.

Various means have been taken to secure a truly impervious wall surface. Parian cement brought to a fine surface and polished was supposed to fulfil the required conditions. In practice, however, it is found to be anything but impervious, and experiments made show it to be almost as absorbent as ordinary plaster. Glazed bricks are perfectly impervious, but do not make a satisfactory wall surface, on account of the numerous joints which have to be made with some more or less absorbent cement. Glazed tiles are open to the same objection. A suggestion has been made to apply some such treatment as the water-glass process, which is used to protect the surface of frescoes from the deleterious action of the London atmosphere ; and it is conceivable that if a silicate enamel can be applied so successfully as to form an unbroken even surface, it would not only be a perfectly non-absorbent face, but it would be practically an everlasting one ; at any rate, its period of endurance would probably be very long. The process, however, is still in the category of unrealised ideals. The French process of "stuc" is practically a painted and varnished wall.

Whatever kind of wall surface is adopted, it is of equal necessity to avoid as far as possible all angles where the air is liable to stagnate. For this reason it is usual to round the angles formed at the junction of wall with ceiling and wall with floor and the vertical angles of the walls. This also has the advantage of facilitating the process of cleaning.

Floors.—In considering the question of flooring in a hospital, regard must be had in the first instance to the general principles of construction which should be followed, and then to the precise form of surface most suitable to each department.

The question of construction is, so far as the upper floors of administrative offices are concerned, mainly one of fireproof or fire-resisting material as against wood; but in wards and some other parts of the building there is also the important question of solid floors as against those which, as in ordinary wood construction, have large hollow spaces enclosed.

In an ordinary floor which does not profess to be in any way fireproof, the construction may be briefly described as of wooden beams or "joists," fixed about 12 inches apart, upon the upper surface of which the floor boards are nailed, and to the under surface of which the ceiling of lath and plaster is fixed. Sometimes a separate set of joists is provided to carry the ceiling independently of the floor joists, but this is a detail which has no concern with the principle under consideration.

There are many ways of constructing a fireproof floor, but it will be sufficient for the present purpose to consider such a floor as one constructed of iron beams embedded in concrete; the important point being that the beams shall be so covered in with concrete that in the event of a fire they would be so protected from the direct action of the flames as to prevent their being so contracted or "buckled" as to endanger the stability of the walls.

So far as the question of fire is concerned, there can be no doubt that all parts of a hospital should, if possible, be constructed of fireproof materials. In the wards the necessity is all the more imperative because of the difficulty of moving the patients in case of a fire, but in the administration buildings the need is scarcely so urgent, and, provided the staircases and corridors are fireproof, the rest of the building may, unless sufficient funds are forthcoming, be constructed in the ordinary way.

In the floors of the wards, as also in the out-patient department and the operation room, there is an additional reason for adopting the fireproof system, as in all these departments it is of the utmost importance to secure a solid and impervious floor surface. With floor boards, even of teak or oak, laid in the most perfect way, it is practically impossible to avoid a certain amount of shrinkage, and in the crevices thus formed a large amount of dust and debris of all kinds is constantly accumulating. The depth to which this

store of dirt can accumulate is, in what are called tongued floors, limited by the position of the tongue, which is a thin slip of iron or wood fitting into grooves made along the edges of adjoining floor boards. The space for the lodgment of dirt is thus limited to about a half or three-quarters of an inch.

Infinitely superior to this arrangement is a floor of solid oak or teak parquet laid on the surface of cement concrete. Such a floor, if properly laid and of well-seasoned wood, forms, when wax-polished or paraffined, a practically impervious solid surface. The paraffin treatment of floor surfaces is as follows: Paraffin in the solid state is melted and painted over the wood, and then forced into the pores of the wood with a hot iron, and the surface is then polished with a brush. A floor treated in this way is very easily kept clean, and only needs to be occasionally brightened up with a moist cloth. It is also claimed on behalf of this process that it prevents contraction of the fibres of the wood to which it is applied. The process was first applied by the late Dr. Langstaff. This kind of floor should, then, be used for all wards, and for the consulting rooms in the out-patient department, and the surgery.

In the waiting-rooms of the out-patient department and the surgery, the corridors throughout the kitchen offices, and the laundry, the best kind of floor surface is that known as "terrazzo"—a mixture of Portland cement and marble chips, which takes a fair polish and is non-absorbent. In the operation room a better form of the same kind of flooring called "mischiati" is desirable. This is formed of cubes of marble laid close together, but without any attempt at regularity of pattern. The surface in this case contains a much larger proportion of marble to cement than the terrazzo, it takes a better polish, and it has a cleaner and brighter appearance. The floors of the mortuary and post-mortem room may with advantage be paved with "mischiati."

In all floors, whether of wood, terrazzo, or mischiati, the angle between the floor and the wall should be rounded to a radius of not less than two inches. Where the walls are of glazed brick this can best be effected by means of a specially made hollow moulded brick. In wards where the floors are of wood, a hollowed fillet of oak best answers the purpose; and where a marble and cement floor joins a plastered or cemented wall, the hollow can best be formed in the material of which the floor is made.

In the foregoing remarks on the treatment of floors in hospitals it has been assumed that the ward floors should be of wood. This

may be regarded as in this country an accepted rule ; but such is not the case universally. In France, for example, ward floors are not infrequently finished with a cement surface, and in tropical climates wood would certainly not be regarded as a suitable material.

In all the details of the joiners' work throughout, the work in a hospital should be simple and good, and unnecessary elaboration should be avoided ; but in all wards and adjacent offices, and in all other parts used by or for patients, these precautions are doubly necessary to be observed. It should be regarded as a fixed and essential rule that no mouldings involving sunken recesses or grooves should be permitted, and that all angles in which dirt can lodge should be abolished. It cannot be too often or too strongly urged that every opportunity for the lodgment of dirt means so much added danger of septic poisoning ; and no consideration of ornament, or even of beauty, should be suffered to weigh for a moment against this most essential rule.

In the construction of windows in exposed situations, the value of double glazing is scarcely sufficiently recognised. Two sheets of a thinner glass than would perhaps ordinarily be used, with an air space of $\frac{3}{4}$ in. between them, makes a most effectual non-conducting surface, without incurring a very greatly increased cost. Care of course must be taken in making such sashes that the space is made perfectly air-tight.

In the construction of doors and the linings and architraves pertaining to them, the same rules apply. There are one or two minor details as regards doors which should not be lost sight of. (1) All doorways into wards or bath-rooms ought to be made sufficiently wide to allow of a bed being wheeled through. (2) In all cases of rooms or store closets, which are habitually kept locked, the locks should be provided with one or more master-keys, so that the chief officer, whether matron or steward, having control over them should be able to get access to each and all by the use of one key only.





CHAPTER III.

DRAINAGE AND PLUMBING.

DRAINAGE.—*Square stone and barrel drains—Pipe drains—Principles of good drain-laying—Manholes—Traps—Automatic flushing tank—Ventilation.*

INTERNAL PLUMBING.—*Water-closets—Sinks—Baths—Lavatories—Drainage of East Suffolk Hospital, Ipswich.*

AMERICAN SYSTEMS.—*Johns Hopkins Hospital—Barnes Hospital—Varying arrangements—The most approved water-closet—Bath tubs.*

DRAINAGE.

IN these days of sanitary science it almost amounts to a truism to say that a hospital should be properly drained, and that attention should be paid to such details as efficient ventilation, proper disconnection, and the like. Unfortunately, however, it is only necessary to examine a dozen or so plans of existing hospitals picked out hap-hazard to find that, while on every hand dwelling-houses are being re-organised on the strictest principles of hygiene, a very large proportion of hospitals are far behind the age in their sanitary arrangements.

It becomes, therefore, very necessary in a work dealing with hospital construction to enter somewhat minutely into the essential principles of drainage and sanitary arrangements.

The obvious use of a drain is to provide a channel for carrying off as quickly as possible to their ultimate destination the waste matters poured into it. In order to do this effectually the drain should be of such a size, inclination, and material as to present every possible facility to the work in hand. It is therefore necessary that the course of the drain should be as direct as possible, and that the least possible amount of friction should be presented to the flow of sewage.

The old-fashioned way of forming a drain was to make it either of stone or of brick ; often a square section was adopted (fig. 1), and invariably the size of the channel, whether round or square in



FIG. 1.—SQUARE STONE DRAIN.

section, was far too large for the work it had to do. The effect of such a system was that the drain became an elongated cesspool, and as the surface of the bricks or stone was always more or less

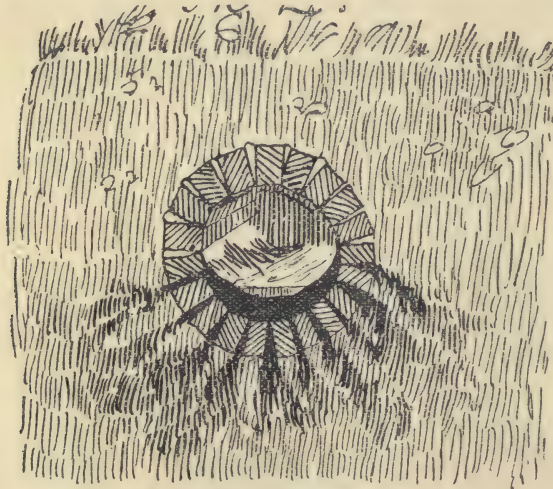


FIG. 2.—BRICK BARREL DRAIN.

uneven, the impediments to the flow of sewage were very frequent. Another great evil in this mode of constructing drains was the nature of the materials ; bricks under the influence of sewage

become rotten, are easily accessible to the attacks of rats, and quickly become more or less pervious ; stones, in the way they were used to form drains, were as bad, as the joints were always imperfectly made, and free passage was allowed from the drain into the surrounding earth.

The invention of salt-glazed pipes for the conveyance of sewage was a great step in advance over the old system of brick or stone drains, but the old system of forming the joints with clay was a very bad one. The end of one pipe, called the "spigot end," fits into a socket formed in the end of the next pipe, and the annular space between the ring of the socket and the spigot has to be filled in with a substance of some kind. The old-fashioned way of doing this, and a way that is still clung to by many builders and even by some surveyors to local sanitary authorities, is to fill in the space, or "lute" it, with tempered clay. Theoretically the joint was supposed to be a puddled or water-tight one—in practice it becomes a "vanishing" joint. Anybody who has had practical experience in taking up old drains knows that in removing a clay-jointed drain it will generally be found that the clay has almost completely vanished, leaving the joint as free as if it never had been filled.

Now in order that a drain may conform to its essential purpose of carrying off the sewage swiftly and completely, clearly the first thing to be done is to make it water-tight. To accomplish this, two things are necessary ; first, a solid bed on which to rest the pipes, in order to prevent them from sinking ; and secondly, an unbroken impervious and insoluble joint. The first requirement is fulfilled by laying the pipes in a solid bed of concrete (fig. 3), unless the ground is of so rigid a nature as to render such a precaution unnecessary ; and the second can be attained by the use either of Portland cement, or of one of the bituminous patent joints now in the market.

The joint known as the "Stanford" is a good example of this last-mentioned method, and was the first joint of the kind to be devised. In this joint a ring of bituminous nature is cast on to the spigot end of the pipe, and the inner edge of the socket end is lined with similar substance, the two pipes are then fitted together and the joint is filled in solid with a mixture of Russian tallow and resin.

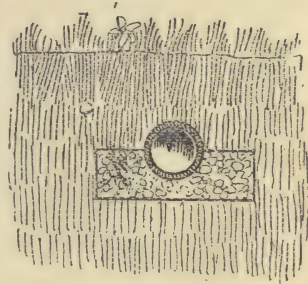


FIG. 3.
PIPE LAID ON CONCRETE.

A joint thus made will stand testing with water at a considerable pressure within a very short time of its being finished. Having provided secure means for keeping the drain-pipes in their places and for rendering them water- and air-tight, it is necessary to ensure that, by providing them with a proper and sufficient inclination or fall, their contents shall be swiftly carried off and not allowed to accumulate.

The inclination of a drain frequently is fixed by local circumstances which are unalterable. For instance, it may happen that the sewer is only just low enough to take the drainage of a building with the least possible fall. In circumstances of such a kind the drain must be laid with such fall as can be got, and recourse must be had to systematic flushing to keep it clean. Where, how-

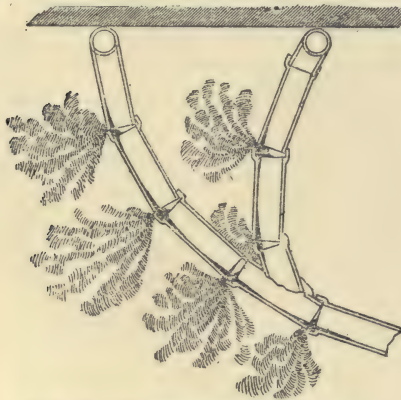


FIG. 4.—DRAINS IMPROPERLY LAID AND JOINTED.

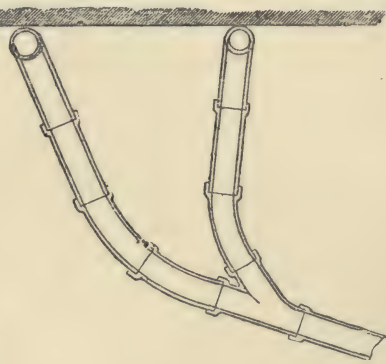


FIG. 5.—DRAINS EFFICIENTLY LAID.

ever, no such difficulties exist, the drains should be laid to an even and regular fall throughout. No rigid rule can be laid down for the amount of fall necessary, as different cases often require very different treatment; but it may be taken as a general rule that a fall of one in thirty is a good working standard. It is better to get a slighter gradient evenly all over the system than to lay the drains at varying falls.

The size of the pipes must also be determined by the actual requirements of each case. It may, however, be remarked that the usual practice is to make pipes of much too large a diameter. Every inch of unnecessary size in a pipe means so much additional friction. In determining the sectional area of the pipes, regard must be had to the amount of sewage likely to be discharged into

them, and whether or not the rain water is separated from the sewage ; and upon these considerations only, and not upon hazard or rule-of-thumb, should the size be fixed.

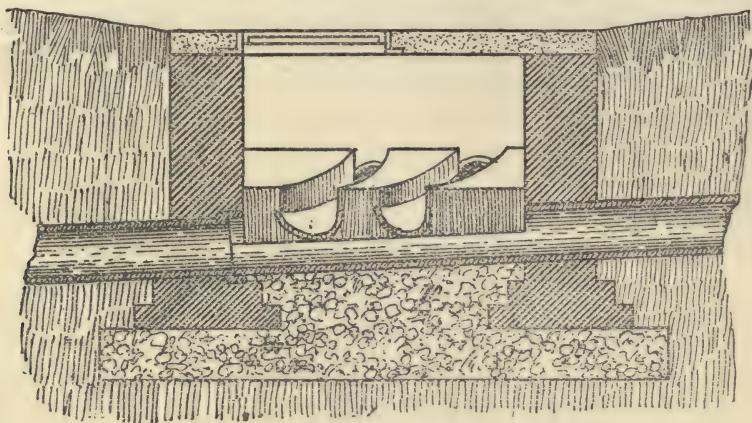
Drains should never be laid underneath buildings where it is possible to avoid so doing. The possible subsidence or "settlement" of the superstructure is liable to crack the pipes and cause leakage of the sewage matter into the ground. Thus the earth under the building would be contaminated with organic matter and the effluvia drawn up into the interior of the building. Where, however, it is impossible to avoid carrying a drain underneath a building, the pipes, after being carefully laid and tested, should be covered with a solid bed of cement concrete. At every point where a pipe passes through a wall an arch should be formed in the brickwork to relieve the drain of all pressure from the superincumbent brickwork. It is also a good plan to substitute heavy socketed iron pipes with caulked joints for earthenware pipes, in cases where the drain runs under the building. Such pipes have fewer joints in proportion to their length, and are less liable to fracture than earthenware pipes.

An essential element in good drain-laying is that the pipes should be laid in absolutely straight lines. There is no difficulty whatever in this, and indeed it is remarkable to see in many instances what a degree of skill has been expended in devising curves and bends where a straight run of pipe would have been obviously simpler and cheaper. The only curves that should be allowed are those which must occur when a pipe joins another at an angle, or when it has to take a different direction (*see* figs. 4 and 5).

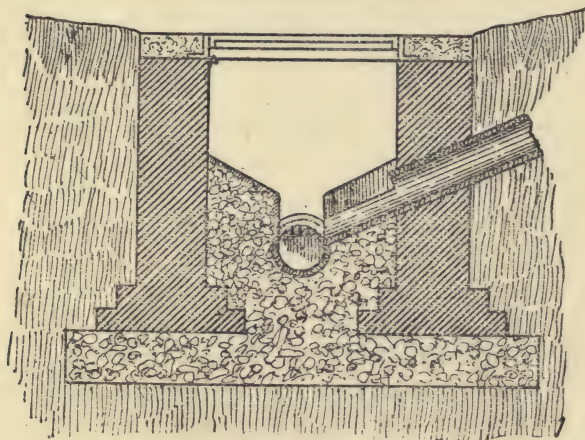
This brings us to the subject of inspection or examination of drains. However well laid a drain may be, it is liable to become choked from carelessness or mischief. A brush or a house flannel, or some other equally foreign substance, if put into a drain will very speedily cause a stoppage ; and if there are no means of getting down into the drain and localising the cause of the mischief, the ground must be opened and the drain broken into in order to find out the cause.

In all properly constructed drains, therefore, manholes, which are square chambers built of brickwork and provided with doors or stone covers, should be constructed at suitable points and of sufficient size to allow a man to get down and have room to work the drain rods. The most suitable points are where junctions occur ; that is to say, where one or more branch drains join a main drain.

Where the drains pass through the manhole they should be formed of half pipes or channels, so that access is had to every drain falling into each particular manhole. A well-considered system of manholes is, no doubt, expensive in first cost, but it well repays the outlay by



Section through Manhole



Section across Manhole.

FIG. 6.—DETAILS OF A MANHOLE.

the very large saving effected in the cost of repairs, besides the very great advantage gained by having the means of periodically inspecting the state of the drains. An example of the usual form of manhole is given in figs. 6 and 6a. In those sketches the branch drains are seen coming in at a higher level than the main channel,

and the branch channels are specially made for this purpose, the object being to increase the velocity at this point in order to prevent the sewage heading backwards up the central channel, and also to counteract

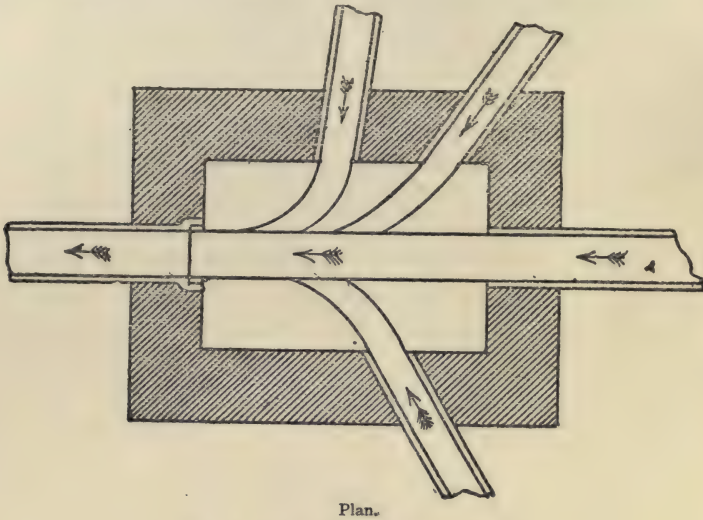


FIG. 6a.—DETAILS OF A MANHOLE.

the increased friction from the open channel. It is also well, for the latter reason, to give a slightly increased fall to the centre channel.

A "trap" is a device to prevent the air from the sewer or drain from passing beyond a given point. Traps are required at various

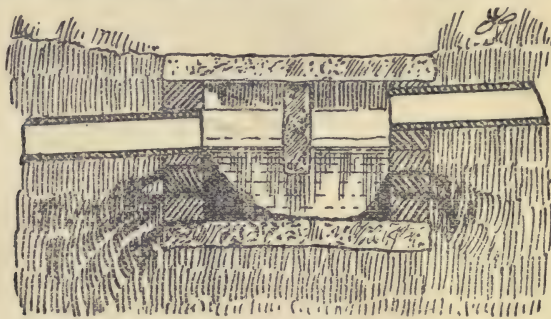


FIG. 7.—SECTION OF A DIP-TRAP.

points; the first and most important point being that at which the drain is to be severed (so far as atmospheric connection is concerned) from the sewer. A common mode of forming a trap for

this purpose, not, unhappily, yet quite obsolete, is what is known as a "dip" or "mason's" trap (fig. 7). A square chamber is formed of brickwork divided into two parts by a stone. The inlet and the outlet are kept up some distance from the bottom of the chamber, which, therefore, always holds a certain quantity of water. Into this water the dividing-stone dips; hence the name of "dip-trap." The formation of this trap is such that while it performs its function of keeping back the air from the sewer from entering the drain, it counteracts the good done by this arrangement by forming in itself a small sewage tank wherein fœcal matter accumulates until it becomes necessary to clear it out.

The proper form of trap to be used for the purpose of keeping

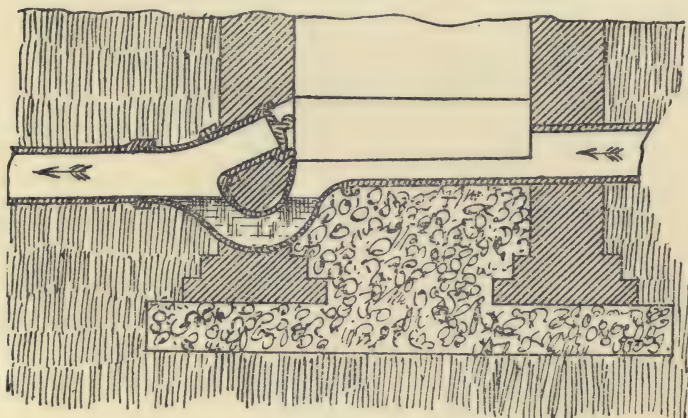


FIG. 8.—FIELD'S SYPHON TRAP.

the sewer air out of drains is shown in fig. 8. This particular trap is made with a short piece of channel pipe at the upper end in order that it may be fixed in connection with a manhole. Where, however, no manhole exists at the point where a syphon trap is fixed, a similar form of trap can be obtained without the half channel. As will be seen from the drawing, the trap holds a certain body of water maintained at a constant level, and into which the upper part dips to a depth of about two inches. The formation of the trap is such that it is as nearly self-cleansing as it is possible to make it; and there is no possibility of any accumulation of solid matter.

Traps are needed to receive the waste pipes from sinks, baths and lavatories, and for rain water pipes, and the surface drainage from yards, roads, and other open spaces requiring drainage. For

the first-named purpose a trap of the form shown in fig. 9 is most suitable. The waste pipe should enter under the grating and well above the water-line, and should be bent over so as to give the water a vertical direction in entering the trap. The waste pipes from post-mortem-room sinks and from slop sinks should not discharge into traps of this kind, but, as will be explained hereafter, should, as a general rule, be connected directly with the drains.

With regard to the necessity for grease traps, opinions differ very greatly. One thing, however, is not open to question, and that is, that the old-fashioned form of grease trap, which was nothing more than a huge tank cleared out at intervals of three, six, and even twelve months, is an abomination not to be tolerated. A

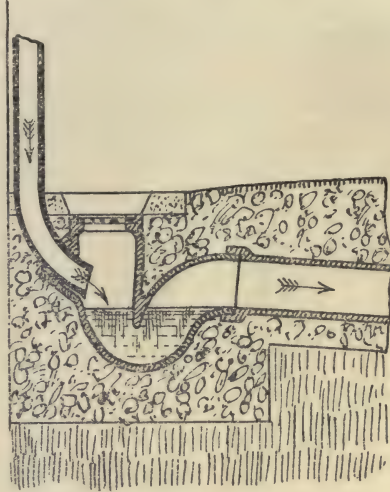


FIG. 9.—INTERCEPTING TRAP.

properly formed grease intercepting trap consists of a tank (fig. 10) into which both inlet and outlet pipes dip some little distance into the water. The grease, which is carried down along with the hot water discharged from the scullery sink, quickly congeals and rises

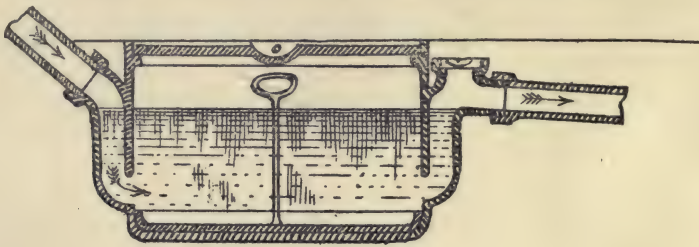
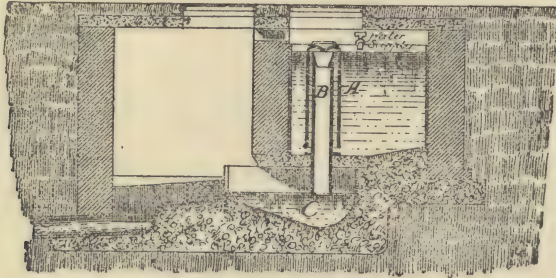


FIG. 10.—GREASE TRAP.

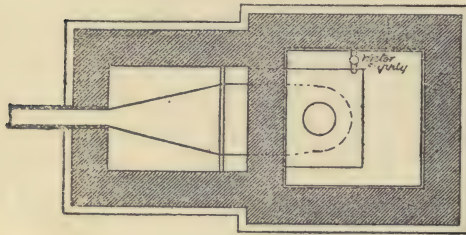
up to the top, where it forms a compact layer on the surface of the water. This grease should be regularly and periodically removed at short intervals, and to facilitate this the tank should be provided with an easily removable iron cover. An arrangement should also be made for completely emptying and scouring out the whole tank.

The systematic flushing of drains is a most important matter, and greatly contributes to their efficiency. A good deal can, no doubt, be done by means of a hose pipe, or even by buckets, but it is far better to have an automatic system, which will work with little or no attention.

For this purpose the automatic syphon devised by Mr. Rogers Field is one of the best appliances to be had. It consists (fig. 11)



Through the Tank.



Plan.

FIG. 11.—DETAILS OF THE ROGERS FIELD AUTOMATIC FLUSH TANK.

of two tubes, one (A), the shorter, having one end closed and being greater in diameter than the other (B), over which it is inverted. The longer tube dips into a water trap (C), the water in which is kept in position by the weir (D). The action of the tank is as follows: the water as it rises in the tank rises at the same time in the annular space between the inner and the outer tube; when it reaches the top of the inner tube it is thrown off by the lip which is formed there and drops down clear of the sides of the tube, and in so doing carries down sufficient of the air in the tube to form a partial vacuum and disturb the balance of atmospheric pressure on the surface of the water. The effect of this is, that the whole contents of the tank are rapidly discharged down the long arm of the

syphon and into the drain. These automatic syphons are useful for many purposes besides flushing drains. They are adapted for receiving the whole contents of waste-water drains and discharging them into surface or sub-irrigation drains, for flushing urinals, or in connection with ranges of trough water-closets.

The vertical pipes which convey the sewage from water-closets are usually called soil pipes, to distinguish them from the "waste" pipes, from sinks, &c.

The most suitable material for a soil pipe is lead, but care should be taken to have the lead of sufficient strength. The ordinary weight used by builders for soil pipes is 6 lbs. to the foot, whereas the proper weight is 8 lbs. The joints must be made of absolute rigidity, and the pipe must be so supported on the wall that it cannot move. In soil pipes, as in drains, the size should not be too large, as the larger the pipe the less chance there is of its being effectually scoured out. Three-and-a-half to four-and-a-half inches will usually be found ample for the greatest number of closets likely to be connected on one stack. At its lower end the soil pipe should be carefully connected to the drain without the intervention of any trap, and above the highest water-closet it should be carried up its full diameter as a ventilating pipe to some point well above the heads of all windows and away from the possibility of its air being drawn down into any neighbouring chimney.

When the whole system of drainage is laid, it is necessary to test every part carefully. For the underground drains there is no better test than that of water. Taking, for convenience' sake, a section at a time, each length of drain from one manhole to another is plugged at the lower end and then filled with water and allowed to stand. If the water remains steadily at the same level, the pipes may be passed as sound; if, on the other hand, it gradually sinks down, there is a leakage somewhere, either through a faulty joint or a defective pipe, which must be remedied before the drain is passed.

Vertical pipes are best tested with smoke, which can be very readily applied, and has the advantage of being perceptible both to the sense of sight and to that of smell.

INTERNAL PLUMBING.

Of the internal fittings the most important is the water-closet apparatus. For a hospital, simplicity of parts and sound durable construction, combined with the utmost facilities for cleanliness, are

the essential requirements. It is no part of the present work to advertise any special maker's wares ; the general principles, therefore, of a good apparatus only need here be specified. There should, then, be no parts likely to get out of order, no complicated and expensive mechanism such as is found in valve-closets of the best type. The basin and trap should be entirely of earthenware, of the best quality and with a good glaze. The whole should be white, and no ornament of any kind should be permitted. The form of the trap should be devised with a special view to its self-cleansing properties, and those apparatus which have the trap immediately under the basin are to be preferred to those in which the basin is made to contain a little water and the outlet into the trap is at the back. This kind of apparatus is known by various names and is made by various makers, but in all it is a variation, more or less improved, on the kind known as "wash out." The water is supplied by a small flushing cistern, the capacity of which ought not to be less than three gallons, though the London Water Companies will generally insist upon reducing the amount to two gallons. The action of the cistern should be automatic ; that is, the whole of the contents should be discharged when once the handle is pulled ; it should not be dependent upon the handle being held by the person using the closet.

Slop sinks should be treated in every way as water-closets. The particular form most suitable for the purpose will be described in a subsequent chapter.

For the ordinary washing-up sinks in the duty rooms and sculleries, glazed fireclay is the most suitable material.

Baths in hospitals are usually now made of glazed fireclay, and a most excellent and durable material it is, the only drawback being that it is colder to the touch than metal. This, however, is of no great moment. Portable baths on wheels are of great service, especially in small hospitals. The great failing of most portable baths is the inferior quality of the wheels and framing on which they are hung. These parts should always be made by a competent engineer, and the slight excess of cost will be more than compensated for by the far greater ease with which the bath can be wheeled about when full of water.

Of lavatory basins there is not much to be said. There should always be a sufficient supply of fixed basins to every ward, the number being regulated by the number of beds. In a ward for twenty beds, for instance, four or five basins will be found quite sufficient.

As a practical example of bad and good drainage arrangement, two plans are given of the East Suffolk Hospital, Ipswich (fig. 12).

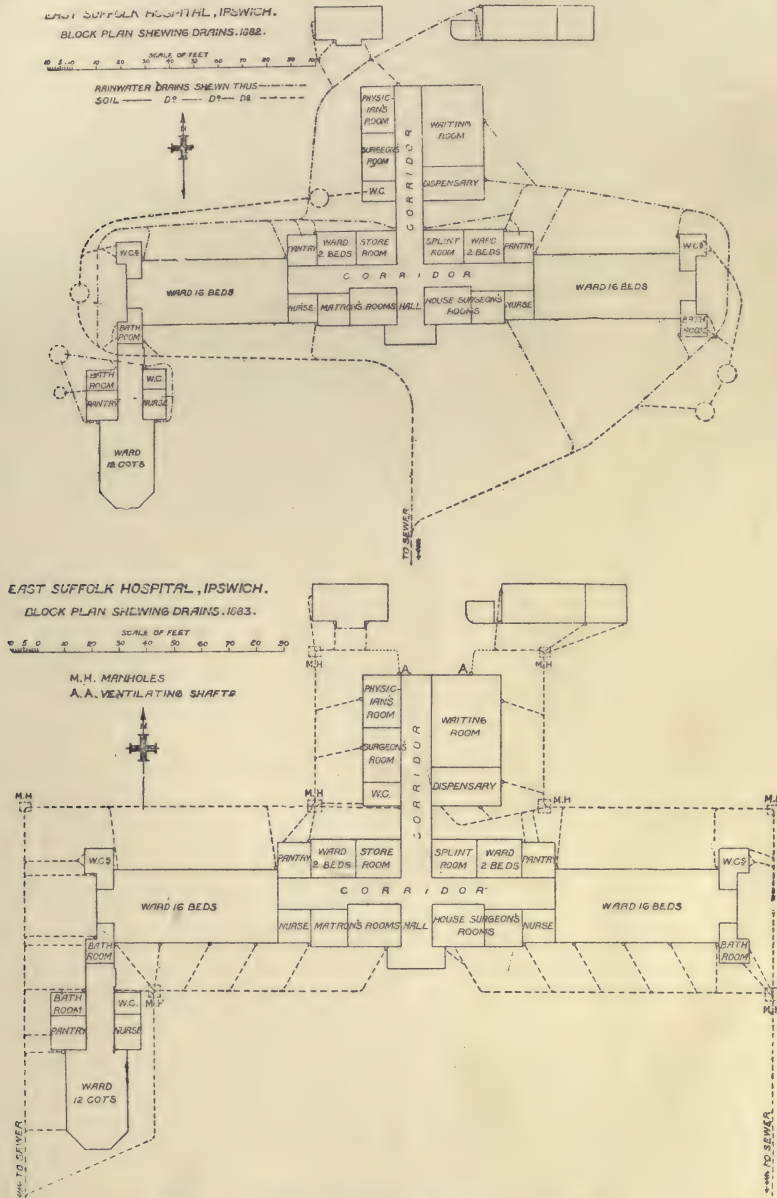


FIG. 12.—EAST SUFFOLK HOSPITAL, IPSWICH.

The first plan shows the system of drainage prior to 1882. The lines of drains were curved in every direction, and at several points (indicated by circles) were cesspools. The connections between baths, sinks, &c., and the drains were direct, and no means of ventilation appears to have existed.

In 1882 the whole system was reorganised, drains were laid in straight lines from point to point, cesspools were abolished, man-holes were formed at junctions, waste pipes were disconnected and trapped, and the whole system was ventilated.

DRAINAGE SYSTEMS OF AMERICAN HOSPITALS.

The drainage systems of the great majority of hospitals in the United States connect with the city sewers, usually by terra-cotta pipes about twelve inches in diameter, although in the older institutions the cylindrical brick drains, from two to three feet in diameter, which were first constructed, are still in use.

The principal exception to this rule of connection with the municipal system of drainage occurs at the Johns Hopkins Hospital in Baltimore. That city has no system of sewers properly so called, and the excreta are usually stored in more or less leaky cesspools, whilst the house slops from kitchen, laundries, &c., are allowed to run in the street gutters, which have considerable slopes and are frequently flushed. The so-called sewers in certain parts of Baltimore are intended for the removal of excess of surface rainfall only, and it is forbidden by law to discharge water-closets into them. The Johns Hopkins Hospital has two entirely distinct systems of pipes for the removal of fouled water, one connected with wash-basins, kitchen sinks, &c., which discharges into the city drains, and the other connected with water-closets, ward sinks, and baths, &c., which discharges into a well about sixty-five feet deep, at the bottom of which a horizontal tunnel is driven in the coarse gravel at right angles to the general direction of the flow of the sub-surface water in this stratum, which passes down the hill towards the harbour.

Both sets of pipes are suspended in a tunnel which runs beneath the connecting corridor, and the arrangement is such that each can be at once connected with the municipal system of sewerage as soon as this is constructed, which it is supposed will be done in a few years. As a rule, in other hospitals there is but one system of pipes for all fouled water, from whatever source it is derived.

At the Barnes Hospital, in the grounds of the old "Soldiers' Home" at Washington, the sewage of all kinds is collected in one large cesspool with strainers, from which the overflow passes out through terra-cotta pipes to a system of sub-surface irrigation, there being plenty of land available for this purpose. In some of the Military Hospitals at ports near the north-west frontier, where the winter temperature is very low, earth-closets are used with satisfactory results.

The arrangements of soil pipes, traps, &c., in American hospitals constructed within the last fifteen years are in accordance with the municipal plumbing regulations in their respective localities. These regulations differ somewhat in details in different cities, but agree in requiring—that all soil pipes within or beneath buildings shall be of heavy cast iron; that there shall be a disconnecting trap between the house drains and the sewer, with a fresh air inlet on the house side of the trap; that each line of vertical soil pipe shall be prolonged upwards full size through the roof and open freely to the external air at the top; that all fixtures shall have separate traps as close to themselves as possible; and that each of these traps shall be ventilated or back-aired to prevent syphonage and also to avoid dead ends, so that there may be a constant supply of air to all parts of the system. The simple **S** or half **S** trap is the form most used, although some form of mechanical trap with a floating ball is occasionally used on wash basins, and in Boston the so-called "pot-trap" is used for the same purpose. In the older hospitals much of the ancient plumbing work has been changed and made to conform to modern requirements, but in some of these the old-fashioned pan closet is not wholly a thing of the past, and some curious specimens of misplaced traps, or even of total want of traps, to wash basins and bath tubs may be found. Every year, however, sees improvement made in this respect.

The form of water-closet most approved for hospital purposes in America is a porcelain wash-out closet having the trap in one piece with the bowl above the floor, and next in public favour comes the short porcelain hopper. All American hospitals have a constant water supply, and each water-closet has a separate cistern with a ball valve, so as to entirely disconnect the fixture from the general supply. The same is true for the best forms of ward sinks, which are either of porcelain, with a flushing rim and special flushing cistern in addition to the usual draw cocks, or else are large deep truncated cones of copper.

The bath tubs are, as a rule, made of cast iron, enamelled or painted on the inside, and not encased in wood ; copper bath tubs are found in some of the older hospitals, whilst porcelain tubs are hardly ever used. Portable tubs are rarely seen, though they exist in several hospitals, and in the Johns Hopkins Hospital all the ward bath-room tubs are portable by means of a special truck. This hospital has, in addition to the usual ward bath-rooms, a special separate building containing arrangements for Russian, Turkish, and medicated baths of various kinds.

In American plumbing lead is used to a much less extent than it is in England. The soil pipes and traps are usually of cast iron, which is coated with tar, and when the material is of proper weight the results appear to be very satisfactory. Brass piping is sometimes used for hot-water connections, but galvanised wrought-iron pipe is much more common, and seems to be equally satisfactory. In general, it may be said that the plumbing and drainage of hospitals in America is arranged in accordance with the plans advocated in England for the last twenty years. A few of the large recently-constructed hospitals have elaborate detailed plans of all pipes and sewers in the grounds, but many of those built more than fifteen years ago have no such plans, and with all the changes and repairs which have since been made it is sometimes very difficult to tell what connections or traps exist, since these are often concealed in floors or partitions.

In the best of these hospitals all pipes and traps are either fully exposed to view, or are easily accessible by opening a door into the pipe shaft.

The chief difference between hospital plumbing in the northern part of the United States and in England lies in the fact that in the former locality soil pipes and fixtures are usually placed on inner walls in order to prevent the freezing of pipes in the severe winter weather. Special arrangements for ventilation of the underground sewers within the hospital grounds are rarely made, the vertical open soil pipes being trusted to in case the disconnecting traps should be forced.





CHAPTER IV.

PLANNING.

DEVELOPMENT OF HOSPITAL PLANNING.—*Mediæval hospital wards—in Italy—in England—The ‘room system’—Military hospitals—Development of the ‘pavilion’ system.*

ADMINISTRATION BLOCK.—*General arrangement—Business offices—Steward’s stores—Linen store—Surgery—Porters—Female servants—Kitchen offices—Planning of residents’ rooms.*

THE WARDS.—*Forms of wards—Arrangement of beds—Floor space—Wall space—Height and cubic space—Ventilation and warming—Windows—Water-closets—Sinks—Baths and lavatories—Ward sculleries—Nurses’ rooms—Isolation wards—Cupboards—Balconies—Flat roofs—Shoots for clothes and dust—Lifts—Temporary wards v. permanent wards—Position of wards in relation to corridor and staircase—Barrack wards—One-storey wards—Heating and ventilation in American hospitals.*

Operation room—Laundry, with engine and boiler house—Disinfecting house—Mortuary and post-mortem room—Out-patient department—Nursing Homes.

ON THE DEVELOPMENT OF HOSPITAL PLANNING.



FROM the few ancient examples that still remain to us, the mediæval idea of a hospital ward appears to have been that of a large hall where patients could be placed together in such wise as to render supervision as easy as possible. In the examples given by Viollet-le-Duc (“Dictionnaire Raisonné de l’Architecture,” article on “Hôtel Dieu”), one, that of Angers, shows a large hall with a vaulted roof, and divided by two rows of columns into three aisles. At least four rows of beds could be placed between the external walls; but it is more than likely that each aisle contained two rows, making six in all. The windows were placed high up in the wall, the height from floor to sill being about sixteen feet. A similar arrangement exists at Chartres, and at Ourscamp. At Tonnerre is an example of a ward built towards the latter end of the

thirteenth century. It consists of a great hall, at one end of which was formerly a staircase, an entrance porch, and a small chapel; at the opposite end was an apsidal chapel containing a high altar, with two side chapels, and the tomb of the foundress, Marguerite de Bourgogne, Queen of Sicily, the whole having been enclosed by a screen, across the top of which was a gallery affording means of communication between the two galleries which ran along each side of the hall. The beds were placed in alcoves or cubicles, forty in number, and the side galleries referred to were intended to afford means of supervision from above. The window sills were above the floor of the galleries, and consequently must have been some twelve feet above the ground floor. What with the wooden partitions of the cubicles, the overhanging galleries, and the great height of the window sills above the floor, the chance of the patient getting any change of air must have been small indeed, notwithstanding that the apex of the open roof was something like fifty feet above the floor.

The interesting examples cited owe their preservation probably to the monumental character of their architecture, and may fairly be regarded as types of what was thought best in their time.

The great hospitals of Italy, again, are to a large extent charitable foundations of the middle ages, and many of them are of extreme interest architecturally. The great hospital at Milan, for example, which can house some 3,500 patients, is a building interesting in itself and in its associations. It has one large central courtyard, on each side of which are four smaller courtyards; the wards being planned in the form of a Greek cross, with a cupola at the intersection, under which is an altar. This form is to be found in many of the older Italian hospitals, and an example of one, the women's ward, hospital of Sta. Maria Nuova, Florence, is given by Howard ("Lazarettos," sect. IV. p. 53). Within the four arms of the cross are no less than 160 beds. Speaking of another Italian hospital, Howard points out the evils attendant upon the neglect of proper separation between surgical and medical cases—a separation which could not possibly be effected with wards of such enormous dimensions. In no other country, with the exception, perhaps, of Russia, have hospitals grown to such excessive proportions; but the plan of grouping the buildings round a central courtyard is not confined to Italy. In this way the old St. Thomas's Hospital, and its near neighbour Guy's, were planned; as also are the hospitals of St. Louis and Necker at Paris. At St. Bartholomew's Hospital

a modification of the plan was adopted, the quadrangle being formed by four separate buildings, leaving the angles free.

The great aim up to within almost recent times appears to have been to aggregate together under one roof as many sick as possible, and this end was attained by adding ward to ward and storey to storey until such extraordinary results as the old Hôtel Dieu of Paris were attained. In the older hospitals in England what may be called the room system obtained largely, especially among provincial hospitals.

In very many of the hospitals erected towards the close of the last, or the beginning of the present, century, the plan consists of an assemblage of rooms of varying sizes, opening out of a corridor, which in some cases is lighted and ventilated at the ends only. And here it is interesting to note how far in advance of his time was John Howard in his ideas of what a hospital ward should be. The wards, he says, should be 'fifteen feet high to the ceiling, and distinct ones for medical and surgical patients.' The number of patients to a ward he limits to eight—rather an uneconomical number for nursing purposes—windows should be on the opposite walls, or, as at Leeds, opening into a corridor not less than six feet wide. His recommendations as to windows, the position of water-closets *outside* the wards, and generally as to details of cleansing are all in their way excellent.

It was the neglect of these and other now well-recognised laws of hospital hygiene that impelled an eminent French physician of the last century to condemn hospitals as "a curse to civilisation." So again Sir John Pringle, in his "Observations on the Diseases of the Army" (1812), says, "hospitals are the chief cause of mortality in the army."

The history of English hospitals during the present century abounds with instances of buildings having become so unhealthy that surgeons refused to operate in them rather than run the risk of all but inevitable failure. The latest example is that of the Derbyshire County (now Royal) Infirmary, the older part of which has become so unhealthy that it has been abandoned, and the patients housed in wooden huts pending the erection of a new hospital.

In this matter of healthiness of buildings the experience of the great wars of the century has been most valuable. Beginning with the Crimean War, where the mortality in the badly drained and badly ventilated and overcrowded hospitals at Scutari rose to

42·7 on cases treated, while in the rough wooden huts above Balaclava the mortality was under three per cent.; the same lesson was taught by the experience of the two European wars of later years, and of the civil war in America. Wherever it happened that wounded men were treated in buildings unprovided with efficient means of ventilation, the cases went badly and the mortality rose high, and conversely, no matter how rough a shed might be provided, where there was plenty of free movement of air the best results were obtained. If these lessons taught nothing else, they at least showed the uselessness of a large allowance of cubic space except in conjunction with free ventilation. "For many diseases," said the late Dr. de Chaumont, "especially the acute, the merest hovels with plenty of air are better than the most costly hospitals without it."* A direct outcome of the Crimean War was the publication of Miss Nightingale's "Notes on Hospitals," a work the value of which can scarcely be overstated; and a practical example of the lessons learnt was the erection of the Herbert Hospital at Woolwich, the first military hospital built in England in which the pavilion system was adopted.

As showing the ideas prevalent among medical men little more than thirty years ago, it will be interesting to quote from an article in the "Builder" of September 25, 1858. Speaking of the great value of light both as a curative and preventive agent, the writer said—"Now let us see how light is treated by some popular physicians and ignorant nurses. In nine cases out of ten, a physician will draw down the window blinds and half-shut the shutters, while an ignorant nurse will probably shut the remainder of the shutters—and draw the bed curtains. We have the positive testimony of a well-known London physician given in his report to the Netley Committee, that 'whenever he enters a sick room he takes care that the bed shall be so placed that the patient shall be turned away from the light.' . . . An acquaintance of ours one day passing a barrack saw the windows on the sunny side boarded up in a fashion peculiar to prisons and penitentiaries. He said to a friend who accompanied him: 'I was not aware you had a penitentiary in your neighbourhood! 'Oh,' said he, 'it is not a penitentiary; it is a military hospital. There is a great horror of light on the part of certain army medical men.'"

Some six years after the publication of the article quoted above,

* Parkes's "Practical Hygiene," edited by Dr. de Chaumont; sixth edition, 1883; p. 351.

the famous 'Sixth Report' of the Medical Officer to the Privy Council appeared, containing the report of Dr. John Syer Bristowe and Mr. Timothy Holmes on the "Hospitals of the United Kingdom," together with the valuable remarks thereon by Dr. (now Sir John) Simon. In this report the principle of cross-ventilation to wards is upheld, and the necessity of proper separation between the beds enforced; but there is an evident bias on the part of the authors in favour of hospitals built on the block system as opposed to the pavilion system. The whole tendency of medical opinion has, however, been towards a steady development of the pavilion system, until to-day we see its most extreme point in the absolutely detached buildings of hospitals like those at Halle and Hamburg. Although this extreme point of isolation has not, and probably will not, be reached in England, the principle which underlies it—that of the isolation of each ward from all other wards, and from the administrative offices—is now a well-established one, and we may fairly hope that no new hospital will in the future be permitted to be erected unless this fundamental law is effectually recognised and complied with.

ADMINISTRATION.

The official or administrative part of a general hospital comprises the offices for the transaction of business, residences for the officers and servants, kitchen offices, stores, and, where there is no separate nursing home, the quarters for nurses.

In a large clinical hospital to which is attached a medical school, the residential portion of the hospital will include rooms for numerous house physicians, surgeons, dressers, and clinical clerks. As a rule, these officers are quartered in the main building; sometimes, however, as at St. Bartholomew's, provision is made for them in a separate and distinct building under the care of a resident warden. The nursing staff also ought, if possible, to be housed away from the wards. This is being done at many hospitals—notably the Middlesex, where only the sisters in charge of the wards sleep near their work, and the main body of nurses live in a separate home, self-contained and separately administered. At the London Hospital a very complete home for nurses has recently been erected.

The business part of a hospital usually consists of the board room, offices for the secretary (which ought not to be less than two rooms), steward's offices, and matron's or lady superintendent's

office. The latter is not frequently to be met with, but it is nevertheless a very desirable provision to make. Many people come to see the matron of a large hospital on business, and it is often highly inconvenient to her to be forced to use her private sitting-room for business purposes. In the smaller type of hospital, where there is no steward, it is of even greater importance to provide a business room for the matron.

The steward's stores vary in size with the requirements of the hospital, but should always comprise some kind of office and a place for receiving and weighing goods. The steward's office must be easy of access to the tradesmen and other persons whose business brings them into relation with this officer; it should also be in proximity to the stores, and easily accessible from the wards.

The linen store is under the charge of the matron, and should be of sufficient size to afford room, not only for the storage of linen and the multifarious things required for mending and making, but also for the accommodation of at least one work-woman occupied in mending or marking linen, and in making draw sheets and other things required for use in the wards.

In some convenient part of the administration block a room should be provided for the visiting staff, where consultations can be held, and where the medical committees can meet. Adjoining it should be a lavatory and water-closet for the special use of the members of the staff. In the smaller class of hospitals the Board room will probably be used for this purpose, and will also be often required to afford house room for the library of the local Medical Society.

Wherever the out-patient department is contained, as it ought to be, in a separate building apart from the hospital, a surgery must be provided in the main building where accidents and casualties can be attended to at times when the out-patient department is not at work. Adjoining the surgery should be at least one small retiring room, where a patient can be, if necessary, stripped and submitted to more thorough examination than would be possible or desirable in the surgery. Proper lavatory basins and sinks must be provided in the surgery, and it should be in communication with the dispensary either by means of a telephone or by a speaking-tube. Bath-rooms should be provided in the main building for the resident medical officers, the matron, the nurses and probationers, and for the servants. It is desirable, if space and

funds permit, that the matron should have a separate bath-room. Water-closets for the foregoing residents must be provided in the same proportion.

Accommodation will have to be provided for porters, both day and night. The number of resident porters will vary with the size of the hospital, but in all cases a common sitting-room is requisite, where the porters can have their meals, and where they will be permitted to smoke when off duty. They also must have their separate bath-room and water-closet.

The bed-rooms for the female servants should be arranged in a group on an upper floor, and should comprise two or three single rooms for the superior servants. There should be a bath-room for the servants' use and a box-room large enough to hold all boxes in such a position that each is accessible to its owner without moving any other.

The kitchen offices comprise the kitchen, scullery, larder, and servants' hall. The proper place for all these rooms is the top of the building—first because the smell of cooking will not permeate the whole building, as is the case when the kitchen is in the basement, and secondly because the kitchen will be lighter and more easily ventilated than it can be in the basement. Examples of kitchens at the top can be seen at the Brompton Consumption Hospital (new part), the Great Northern Central Hospital, London, and the Hastings Hospital. Assuming that there is a suitable room provided in which the servants have their meals, the kitchen should not be any larger than is actually required for use. All unnecessary space means only so much added to the labour of passing between one apparatus and another, and should therefore be strictly avoided. The apparatus in a hospital kitchen must provide for the various operations of roasting, boiling, frying, grilling, and steaming. In small hospitals and in places where the price of gas is prohibitory, a suitable range must be provided; but wherever it is possible to do so, with due regard to economy, gas should be used for roasting and frying. In a properly-constructed gas oven meat is roasted in a way that is quite impossible by any other method. The temperature is exactly the same all round the joint, and the meat is regularly and automatically basted by the condensation of its own vapour; not only is the process of cooking better done, but the waste involved in the process is considerably less. For a properly-equipped kitchen there will then be the following apparatus: (1) a gas roasting oven;

(2) a gas hot plate, fitted with a grid for grilling ; (3) a steaming closet for potatoes and fish ; (4) steam-jacketted coppers for beef tea and broth, and for boiling meat ; (5) a steam-heated hot closet ; and (6) a steam-heated carving table. In addition to the above a steam-heated cylinder for boiling water, and a steam scalding apparatus for milk are requisite. In very large hospitals it will also be necessary to have a separate gas oven for cooking pastry.

The scullery must necessarily adjoin the kitchen, and need not be separated from it by a wall or partition, as is usually the case. The work that goes on in the scullery is an essential part of the cooking process, and should be readily overlooked by the cook. The only case in which any separation is desirable is when the kitchen is used for servants' meals. In such a case it is perhaps desirable to shut off the place in which the dirtier part of cooking work is carried on. But as in all new hospitals the provision of a proper servants' hall should be regarded as a necessity, there need be no question of any division between scullery and kitchen. The sinks for washing vegetables and crockery will be placed in the scullery. These sinks will vary in number according to the size of the hospital, but the minimum should be three. One of these should be of porcelain, and should be reserved entirely for washing green vegetables ; the other two should be of pitch pine or the best yellow deal, and over all should be fixed a mahogany rim. All the sinks must be provided with hot and cold water, and should be so arranged that the water can be kept constantly running when the sink is full. It must also be possible to empty each sink rapidly and completely.

The flooring of both kitchen and scullery should be of some impervious material ; tiles, marble mosaic, asphalt and cement are all of them more or less suitable. Tiles are apt to get slippery, and asphalt is unpleasant in colour and does not look clean. Marble mosaic, if well laid, is quite the best floor surface obtainable, but is very costly. Probably one or other of the various forms of cement paving formed of Portland cement and granite chippings is the most generally suitable floor, in point of wear, appearance, and cost.

The number and size of larders depends on the size of the hospital. In very large hospitals there will be separate larders for cooked and for uncooked food, for milk, and for vegetables. Whenever the kitchen is on the top floor, there must be a larder near the kitchen for cooked food and one in the basement for uncooked stores.

In the planning of the rooms for the resident officers, questions of aspect must not be overlooked. Thus, all sitting-rooms should, if possible, be provided with windows through which the sun will shine at some time of the day. In the relative positions of the rooms for the medical officers and the matron, and in the offices to be provided for their use, care must be taken to ensure that proper degree of privacy so essential to the comfort of each.

WARDS.

The various forms which have been adopted for hospital wards may be classed as follows :—

1. The corridor ward, ventilated on one side only.
2. Long wards, ventilated at the ends only, or at the ends and one side.
3. The double ward.
4. The cross-ventilated single ward.
5. The circular ward.
6. The octagonal ward.
7. Irregular forms.

Class 1.—The first class are to be found chiefly in old hospitals. A typical example is to be seen in the Manchester Royal Infirmary (see plan, in portfolio), where the wards are placed on each side of a corridor. Formerly the corridor walls were carried up to the ceiling ; but, to effect some improvement in the ventilation in some of the corridors, parts of the upper portion of the corridor walls were removed, thus putting the wards into direct atmospheric communication. At St. Mary's Hospital (see plan, in portfolio) some of the wards are placed side by side, with no intervening corridor. An improvement on the foregoing plans is the arrangement by which, as at Sheffield, the wards are placed on one side only of the corridor, the other side being open to the air.

Class 2.—Long wards, ventilated at the ends only, are to be seen at Bremen (*see* Husson, plate xiii. bis), Rotterdam (*ibid.* pl. xiii.), La Clinique Paris (*ibid.* pl. v.), and in the Kent and Canterbury Hospital, and Netley (Nightingale, p. 37). At the first-named hospital the entrance to the wards is from a corridor at one end. The plan of the Worcester General Infirmary ("Sixth Report of Medical Officer of the Privy Council," p. 682) is an example of wards ventilated at the ends and at one side only.

Class 3.—The double ward is the first step towards the perfect pavilion ward. A double ward is in effect two wards placed side by side, but with the dividing wall pierced with openings. Examples of this type are to be seen at St. Bartholomew's, London (see plan, in portfolio), the London Hospital (see plan, in portfolio), and the London Fever Hospital (see plan, in portfolio). In the typhoid pavilion at the latter the spinal wall is absent, the division being formed simply by a row of columns and a wooden partition about seven feet high.

Class 4.—The cross-ventilated single ward is the perfect form of a pavilion ward. In it the windows face each other at equal distances on each side of the ward, and two rows of beds only are to be found. The Herbert Hospital at Woolwich (Nightingale, plate vi., p. 102) is one of the earliest examples of this type. The Lariboisière at Paris and St. Thomas Hospital (see plan, in portfolio), London, are well-known examples of this class on a large scale.

Class 5.—The circular ward. Of this type of ward but few examples exist. The idea of a circular ward originated in England with Professor Marshall, F.R.S., the distinguished surgeon, but was independently worked out by Sir Andrew Clarke, G.C.M.G., in India, and by M. Baeckelmans at Antwerp. The first circular wards to be actually occupied by patients were those of the Miller Hospital at Greenwich. Subsequently the splendid Municipal Hospital at Antwerp, the Victoria Hospital at Burnley, the Infirmary of the Hampstead Workhouse, and the Hastings Hospital, besides two small military hospitals at Milton, near Gravesend, and Seaforth, near Liverpool, were opened. Circular wards have been erected at the new Royal Infirmary at Liverpool, and will shortly be built at the Great Northern Central Hospital, London. The differences between one circular ward and another lie mainly in the mode of attachment to the main building, and in the treatment of the central part. Thus at Liverpool, Burnley, Greenwich, and the military hospitals the rooms on either side of the corridor of approach abut on the circle, while at Hastings and Antwerp the attachment is by a corridor only. At Antwerp and at the Great Northern the connection is by covered bridges, with open spaces between the roof of one bridge and the floor of the bridge above it. At Antwerp the centre of the ward is occupied by a nurses' room. At Burnley and Hampstead a staircase to the roof occupies the central part, while at Hastings, Liverpool, and Greenwich the central portion is occupied by three stoves, with smoke and ventilation shafts. Circular wards

are not well adapted to clinical teaching, where there are many students.

Class 6.—The octagonal ward. Very few examples of this type of ward are to be seen. One is at the Bristol General Hospital; but in this case it is used as a convalescent ward, and evidently owes its origin to exigencies of planning. At the Johns Hopkins Hospital at Baltimore are two octagonal pavilions.

Class 7.—Irregular forms. To this class belong such wards as those of St. Louis, Paris, which are L-shaped, the square wards at Hull, circular-ended wards, as at Charing Cross Hospital, London, and Hardwicke Fever Hospital, Dublin, and the wards of hospitals in old buildings originally built for some quite different purpose.

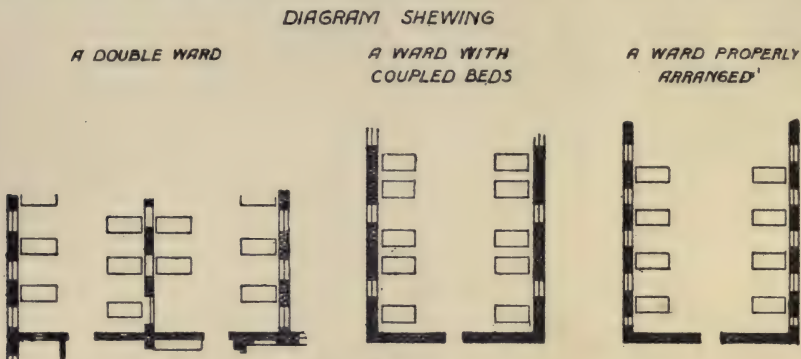


FIG. 13.

The arrangement of the beds in a ward depends on the form of the ward, and admits of very little variation. In classes 1 and 2 the beds are necessarily placed against the opposite walls, and spaced as circumstances admit. In class 3 the beds are invariably placed in four rows—two with the heads against the outer walls, two with their heads against the dividing wall. In class 4 the beds are either coupled—*i.e.* two beds are placed between each pair of windows—or are spaced at equal distances with a window between each two beds (fig. 13). Examples of coupled beds are to be seen at Leeds (Snell, p. 18), the Herbert Hospital (*ibid.* p. 4), and many workhouse infirmaries. In class 5 the beds are always placed against the external wall radiating to the centre. At Burnley the bedsteads are specially made of a less width at the foot than at the head, in order to lessen the effect of the diminution of the floor space between the feet of the beds.

In class 6 the form of the ward militates against any satisfactory

arrangement of beds. For constructive reasons the windows must necessarily be placed on the flat sides, and, in order to be equi-distant, some of the beds should be placed in the angles. As a matter of fact, the beds are usually placed against the flat walls, and thus the distances become irregular. The octagonal form certainly does not lend itself to a regular disposition of beds, whatever other advantages it may possess. Whilst particles of various kind cling to the walls at the juncture of the contiguous sides.

Floor space.—In laying down rules for the sizes of wards in relation to the number of beds, it will generally be found that writers on the subject entirely ignore the question of floor space, and devote all their attention to the question of cubic space. The result of thus omitting what ought to be an integral part of all laws governing the size of wards is well illustrated in a ludicrous *reductio ad absurdum* which occurred in India. Instructions were given for the erection of a hospital for so many beds, with the proviso that to each bed a certain amount of cubic space was to be allotted. The hospital was built, and the wards duly constructed to hold the required number of beds with the cubic space asked for. But when the bedsteads were sent down it was found that the necessary cubic space had been obtained by making the wards so high that the proper number of beds could only be got in by covering the whole floor with them so that no space was left to get at the patients!

Floor space is, in fact, the first thing to be considered; but, in arriving at a proper amount to be given, regard should also be had to wall space—that is, to the distance from centre to centre of each bed. Regard must also be had to the number of beds in a ward, as upon this the question of width largely turns. In a ward of thirty beds, for instance, a width of thirty feet would be appropriate, while in a ward of eight or ten beds such a width would be far too great. In the tables given by Mr. Snell (*“Construction and Management of Hospitals”*), the lowest wall space is at Riga, 5 ft. 9 in., and the highest, 9 ft. 9 in., at Blackburn. The lowest floor space is 69 feet, at the Moabit Hospital at Berlin, and the highest, 149 feet, at Antwerp and Edinburgh. In arranging the width of a ward, regard should be had to whether it is or is not to be used for clinical teaching. If it is to be so used, a somewhat greater width is desirable than if no teaching is to be carried on there. It will be found in practice that 28 feet is a convenient width for a large ward, say, of over twenty beds, while for a small ward of only eight or ten beds, 22 to 24 feet will be ample. Assuming the floor area per bed to be not less than

100 feet, these figures will give for a ward 28 feet wide a wall space of about 7 ft. 2 in., and for the ward 22 feet wide a wall space of just over 9 feet.

It is impossible to lay down any hard and fast rule for the allowance of floor space to be given per bed, but it may be taken that in wards for acute surgical and medical cases (excluding fevers) 100 feet is the minimum floor space per bed, and where it is necessary to obtain great width of ward, as in the case of clinical hospitals, the wall space must not be unduly diminished, but the floor area must be increased. A less distance than eight feet between the centres of the beds is undesirable.

Having determined the floor area, it is necessary to fix upon the height of the ward in order to obtain the requisite cubic space per bed. Here, again, great differences are found to exist. In the tables before referred to (Snell, *op. cit.*) the cubic space per bed varies from 2,544 feet at Riga to 864 feet at the Moabit, Berlin. Dr. Mouat (*ibid.* p. 37) puts the minimum cubic space at 1,200 feet for ordinary cases. Some authorities, notably Parkes and de Chaumont, place the limit at from 1,500 to 2,000 feet. The Barracks and Hospitals Commission gave 1,500 feet for ordinary cases, and in unhealthy districts 2,000 feet. Taking the floor space at the minimum of 100 feet and the height of the ward at 12 feet, the cubic space per bed will be 1,200 feet. But in a ward 80 or 100 feet long and 28 to 30 feet wide, 12 feet is too small a height, at any rate for appearance' sake, and should be increased to 13 feet 6 inches or 14 feet—an increase which will give a cubic space of 1,350 to 1,400 feet, or, if the floor space be increased to 120 feet (by retaining the 8 feet wall space while increasing the width of the ward), the cubic space will be 1,680 feet. Many authorities on ventilation consider that any excess of height over 12 feet ought to be neglected in calculations affecting movement of air (*vide* Billings, "On Ventilation and Warming," p. 43). However this may be, some regard ought certainly to be had to proportion, and a ward should not have the appearance of being too low for its width and length.

Ventilation.—The subject of ventilation and warming is one about which much has been written, but upon which there is apparently little chance of any general agreement being come to. Upon the necessity for ventilation there can be no doubt, and upon the fundamental principles which should determine the quantity of air to be supplied, the temperature it is to be supplied at, and the rate at which the air is to be changed, the authorities are practically agreed.

It is when these principles have to be reduced to practice that differences appear. In the United States, for instance, it is held that to meet special climatic conditions, involving very great thermal changes and an atmosphere of peculiar dryness, it is absolutely necessary to adopt some more or less powerful mechanical means of forcing air currents into and out of wards. In most Continental hospitals also, but more especially in France, it is deemed necessary to adopt mechanical means for renewing the air of the wards. In this country, however, notwithstanding some instances of the contrary practice, it has always been held that the most efficient ventilation is to be obtained by the use of the simplest means.

Ventilation, then, resolves itself into two systems : (1) natural, *i.e.* unaided by any mechanical contrivances, and (2) artificial or forced ventilation.

Natural ventilation depends for its efficiency on the ordinary appliances of windows, aided by the smoke-flues from grates and flues, with gratings and means of closing in the outer walls. The various forms of windows suitable for wards will be described in a later section ; it is only important here to note, that in position the windows should always be opposite to one another, and that the top of the windows should be as near the ceiling as possible. Another point to be remembered is that there should always be a window, however narrow it may be, between the corner bed and the end of the ward. Experience shows that where this is not the case the beds in the corners are the least healthy ones in the ward.

Short flues, provided with means of closing, should be formed through the walls at the level of the floor, one behind each bed, the object being to produce a current of air under the bed, that being the most confined place in the ward.

Advantage may also be taken of the heated column of air in the smoke-flues, by forming extraction shafts alongside the former, the separation being obtained by thin iron plates. The heat from the smoke-flue is readily communicated to the iron division, which again radiates it into the extraction shaft ; the air in the latter, being heated, expands, and thus an upcast draught is created. This arrangement is, however, available only when the ward fires are alight ; but by placing a Bunsen burner at the foot of the extraction shaft a current can be maintained when there are no fires.

Artificial or forced ventilation can be arranged in two ways : either the air can be forced into the ward, or the vitiated air can be

forced out, the first system being known as ventilation by propulsion, the second as ventilation by extraction. At the Lariboisière Hospital, Paris, both systems were established—one side of the hospital being ventilated on a system of propulsion devised by MM. Thomas and Laurens, and the other on a system of extraction devised by M. Duvoir. The terms upon which these systems were established provided that the mean temperature of the ward should be from 16° C. to 18° C. (60·80° Fahr. to 64·40° Fahr.), and that the supply of air per bed should be at the rate of 60 cubic metres per hour (2,119 feet). The plan adopted by MM. Thomas and Laurens was to force air into the wards by means of a fan driven by steam power, the necessary temperature being obtained by passing steam pipes through the air ducts. In this system the vitiated air was forced into the extraction shafts by the incoming fresh air. M. Duvoir, on the other hand, placed hot-water coils in the main extraction shafts to draw out the vitiated air. The result of a comparison of the two systems was very greatly in favour of the propulsion plan; for it was found that, while by the system of MM. Thomas and Laurens the air supply amounted to 3,178 cubic feet per head per hour, by that of M. Duvoir the amount was only 1,059 cubic feet. A comparison of the cost of the two systems showed, however, that the former system was more than twice as expensive as the latter.

Ventilation by extraction has been adopted in several instances in England, notably at Guy's Hospital (new building) and at the new Consumption Hospital at Brompton. In the latter case the conditions are peculiar and altogether different to those of an ordinary hospital. At Guy's the artificial system can be compared with the ordinary or natural system in the older wards; and the result of the comparison certainly does not make for the superiority of the former method.

In relation to the subject of artificial ventilation it will be useful to record again in this place a few noteworthy incidents occurring in this country.

1. *Bristol General Hospital*.¹—At this hospital an apparatus was set up which consisted of a shaft in the garden from whence air was drawn into the basement, where it was heated by passing over a series of hot pipes; from thence the warm air went to the wards. The foul air from the wards was drawn out by a series of shafts communicating with a central tower, in which an up-current

¹ Bristowe and Holmes.

was induced by heated flues. This system was intended to replace open windows and fire-places altogether; but after a short trial it was found that the hospital was becoming infected with erysipelas, and it was abandoned.

(2) *At St. Mary's Hospital, London*, a somewhat similar system was formerly in operation. Dr. Burdon Sanderson made numerous experiments, which showed that the outlets frequently acted as inlets, and that in the shaft itself there was a circulation of air rather than an escape from it.

(3) *Liverpool Royal Infirmary*.—A plan like that at Bristol was tried here, but found useless, and the air shaft was converted into a clock tower.

(4) *York County Hospital*.—At this hospital a combined system of warming and ventilation was set up, and was exclusively relied on for keeping the ward air up to its proper standard of purity—so exclusively, indeed, that the windows were simply glazed panels with no means of opening, and there were no open fire-places in the wards. This system continued in action for some nine years, during which time complaints were frequent of the close and offensive state of the ward air. Wound diseases prevailed and increased, until at last it became impossible to make the simplest incision without erysipelas supervening. After urgent representations by the medical staff the hospital was at length closed, the artificial system abandoned, windows were made to open, fire-places were put into the wards, and every part was thoroughly cleansed. Since that time erysipelas as a hospital disease has disappeared and operations do well.

(5) *Edinburgh Royal Infirmary*.—The facts in regard to this hospital are of a similar nature to the foregoing.

All the cases given above are more than twenty years old, and it may be that the appliances used were not of a sufficiently powerful nature to compass the end in view. It may also be that with improved and widened knowledge and better mechanical contrivances less disastrous results might in the present day be obtained. Be that as it may, the really important point to be kept in view in regard to ventilation is, that before any system depending on mechanical contrivances can be pronounced worthy of adoption, it must be demonstrated beyond dispute that it is not only as good as ordinary methods, but appreciably better. For, nothing but a substantial improvement in the health condition of a ward would justify the largely-increased cost, both of construction and

maintenance, necessarily consequent on the adoption of mechanical ventilation.

Warming.—The question of warming is closely connected with that of ventilation. Of all systems of forced ventilation it forms, indeed, an integral part, and cannot be considered separately. In cases of natural ventilation the question of warming is one by itself.

Open fire-places are undoubtedly the best and most efficient means of warming a ward ; and a not unimportant element in the matter is the question of appearance. An open fire adds unquestionably to the cheerful appearance of a ward, and moreover it gives the patients a *feeling* of warmth which is quite independent of the actual temperature of the ward.

The kind of grate adopted should be one which is supplied with fresh air from the outside, and so, in addition to the radiant heat imparted from the fire itself, a constant stream of fresh warmed air will be passed into the ward. It will be found that a well-devised scheme of this kind will tend greatly to check draughts. The best position for the fire-place is, in a large ward, the centre of the floor, and unless there are imperative structural difficulties in the way the smoke-flues should be taken under the floor. Where this cannot be done, some attempt should be made to render the smoke-flues ornamental, as is the case at Addenbrooke's Hospital at Cambridge, where the flues are made in the form of columns with foliated caps.

Dr. Richard Greene's stove, to be seen at work in Berry Wood Asylum, Northampton, is the very best open-fire system of heating we have ever met with. A form of stove devised by Mr. Saxon Snell is a combination of two open fires and two coils of hot-water pipes. These stoves have been adopted in some large Poor Law Infirmarys, and appear to answer their purpose satisfactorily.

In very large wards it will generally be found necessary to supplement the warming power of the grates by hot-water pipes carried round the walls. In arranging these pipes care should be taken to leave enough room between them and the wall for sweeping the floor without difficulty.

Artificial ventilation at the Victoria Infirmary, Glasgow.—This system, as far as our observation goes, is not satisfactory in the smaller wards ; but seeing that the larger wards appear to be adequately ventilated, we have come to the conclusion that the relative impurity of the air in the smaller wards is due to an inadequate arrangement of the inlets and outlets, and that it cannot justly be put down to a failure of the system in force. A close examination,

and several tests which we applied to the system of ventilation at the Victoria General Infirmary, convince us that, whereas the main duct is kept comparatively free from grit and dust, the smaller ducts, communicating directly with the wards, have not been protected against the intrusion of these deleterious matters. Indeed, the evidence shows that with the air very much enters that should be excluded from the wards, as the walls and ceilings eloquently testify. Having inspected the system of ventilation at the new municipal buildings, Glasgow, which seems to have suggested the plan of ventilation now in force at the Victoria Hospital, we are of opinion that the method of washing the air at the Victoria Hospital is imperfect, and might be improved. This would tend to minimise the amount of dust and blacks which at present find their way into the wards, and if the air was again washed before it entered each ward duct, and if these ducts were to be frequently cleansed, no doubt much that is now objectionable in the system would be removed. Having regard to the temperate character of the British climate, we have yet to be convinced that it is desirable or necessary to introduce artificial ventilation into our hospitals; or, indeed, that it is desirable, or even permissible, to rely entirely upon such a system for the whole ventilation of the sick wards of any British institution which is constantly filled with surgical and other cases requiring an abundance of fresh air. If these objections can be over-ruled, then, no doubt, from its simplicity and comparative cheapness, the system of ventilation in force at the Victoria General Infirmary will commend itself to the adoption of many hospital authorities in the United Kingdom. In other climates, with the modifications we have suggested, the system should prove of real service, and we commend it to the attention of those who have to construct hospitals abroad, as it is well worthy of close study.

Windows.—The question of the disposition of the windows has already been dealt with in discussing the subject of ventilation. The question of the best form of window to be adopted remains to be considered. For all practical purposes the available forms may be taken as three: (1) the double-hung sash, with or without a hopper light above; (2) casements opening inwards or outwards; (3) what is known as the Middlesex Hospital window. In considering the relative advantages of these three forms it is desirable to formulate briefly what it is that is required of a ward window.

Postponing the consideration of the question of light, which is not affected differently by different modes of opening, the first and

chief point to be decided is in what way is it best to admit the air. First of all, it is essential that the amount of air to be admitted shall be easily controlled ; secondly, that the mode of admission shall be such that it does not produce draughts ; and, thirdly, that when the windows are closed they shall be as nearly as possible air-tight. The first form of window consists of the ordinary double-hung sash, with or without a hopper light above. The mode of opening a double-hung sash is easy, and can be regulated to a nicety. If the bottom rail be made about six inches deep and a board five inches deep fixed against it, the lower sash can be raised to any extent, from a fractional part of an inch to just under five inches, without any air being admitted at the bottom, while a stream of air is admitted in an upward direction between the meeting rails of the upper and lower sashes. If, in addition to these sashes, there is also a "fall in" or hopper light above, properly protected at the sides with fan-shaped wings, the sashes may be kept closed whilst air is admitted high up in the ward in an upward direction. If, on the other hand, it be desired to sweep the ward from side to side with a direct current, the full opening of the sashes answers the required purpose most efficiently.

The second form of window—the French casement—admits of being opened in one way only, and however small the aperture may be made, it must extend from top to bottom of the window. These windows are largely used abroad, and have within recent years been adopted in some Poor Law Infirmaries, and it is claimed on their behalf that by opening both leaves at a right angle to the wall the patients in bed at either side are screened from draught, whilst a very large surface of ward air is exposed to direct draught from outside.

The third form is that called the Middlesex Hospital window, which consists of three or more lights one above the other, each hung at the bottom and falling inwards, and all regulated by a rod and lever. With this window the air is admitted with an upward tendency, but as usually made it is impossible to open one without at the same time opening all the others.

Of these three kinds of windows, the one that most efficiently fulfils the condition laid down is undoubtedly the first. It combines the advantages of the third with the peculiar advantages of the ordinary sash, and is more practically useful than the second.

The position of windows in a ward is regulated by the number and positions of the beds, and by the form of ward. In a pavilion

ward of the ordinary type the windows will be opposite each other on the two long sides of the ward, and each bed will have a window on each side of it. It will frequently be found even in recently erected hospitals that the four end beds have a window on one side only, and it has been discovered in numerous instances that the cases in these particular beds have had a tendency to fare badly as compared with others in the same ward. The reason is that angles invariably retard the flow of air, and consequently the corners of a ward are just those parts which are least affected by ventilation. To remedy this, a window should always be placed between each corner bed and the end of the ward. Such a window need not be wider than about 1 ft. 6 in. As a rule, half the width of the other windows is quite sufficient.

The window sills of ward windows should be fixed at such a height from the floor that a patient sitting up in bed or sitting in a chair can easily see out of the windows. There is no possible advantage gained by making the windows so high above the floor that patients cannot see out of them; while placing the sills at a proper height adds much to the cheerful appearance of the ward. The top of the window should be fixed as near to the ceiling as possible, in order to utilise to the full the whole cubic space of the ward, and to avoid a stratum of stagnant air immediately under the ceiling.

As regards the proper amount of window surface, the proportion recommended by Dr. Thorne Thorne in his Report on Infectious Hospitals is a very good working formula. He says that the amount of window surface to cubic space should not vary much beyond the limits of one square foot of window to from 60 to 80 cubic feet of space. In the smaller hospitals, with wards of less than 26 feet in width and a cubic space per bed of 1,200 feet or thereabouts, the lower limit may be found perhaps somewhat excessive, but for all large wards the figures given by Dr. Thorne Thorne will be found correct.

Water-closets.—The necessity which exists for having water-closets placed within easy access of the ward does not need much explanation, but the mode in which such necessity is complied with is not even at the present day a matter of universal agreement. Formerly it was thought sufficient merely to screen off a convenient corner of a ward, and therein to place a closet; and although such an arrangement is probably not to be found existent at the present day, at any rate in England, the closets in many of our older hospitals are not very far removed from this primitive type. It

will be seen that in most of the old hospitals the water-closets open directly into the ward, and that the only attempt at disconnection is the interposition of double doors—a feeble enough attempt to separate the ward air from that of the closets (fig. 14).

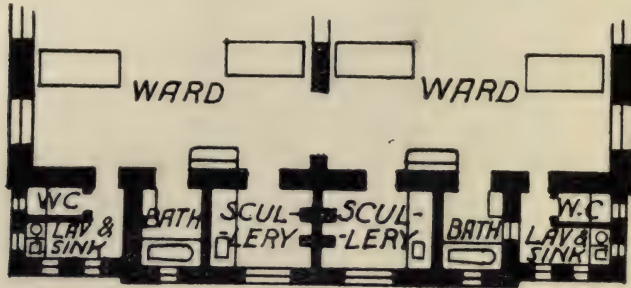


FIG. 14.

Curiously enough, one of the earliest instances—probably the earliest—of water-closets being built out from wards with some attempt at disconnection, is to be seen in the plan of the old Hôtel Dieu at Paris, but in all probability the meaning of this arrangement is to be credited to the fact that this plan facilitated the dis-

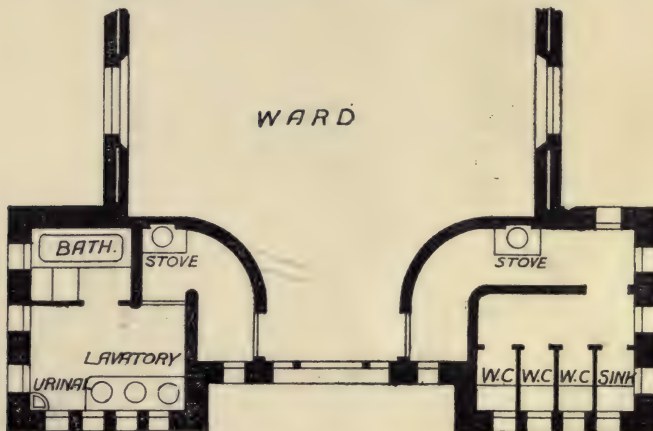


FIG. 15.

charge of faecal matter into the Seine, over which the closet buildings were projected.

One of the earliest writers to draw attention to the necessity of cutting off the closets from the ward air was Miss Nightingale. In

"Notes on Hospitals" this eminent authority publishes a plan for what was then considered a perfect arrangement of water-closets, baths, and lavatories. This plan (fig. 15), with some modifications,

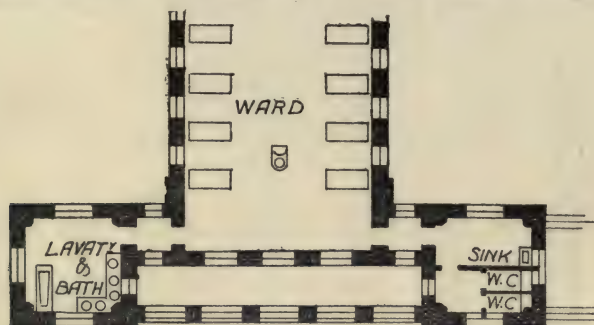


FIG. 16.

was adopted at the Herbert Hospital, Woolwich. The object of the curved passage is to provide that access to the closets shall be through a space capable of being swept from end to end by a current of air, so that any air current coming from the closets shall be, as it

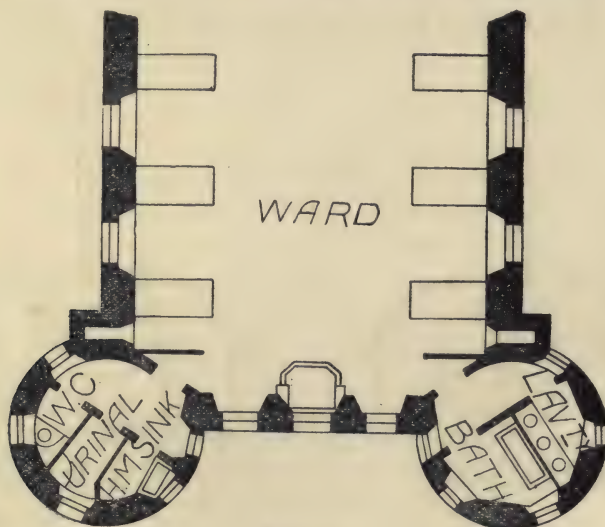


FIG. 17.

were, intercepted and prevented from entering the ward. With the object of assisting this, and of counteracting any tendency there might be for the warmer air of the ward to draw air from the

closets, a stove is placed in the passage to raise the temperature to that of the ward. The defect in this plan is the unnecessarily long passage, and the circuitous path which the air has to travel between the windows at either end. The slop sink, too, ought to be placed in the lavatory, and the urinal with the water-closets.

The plan adopted at St. Thomas's Hospital (fig. 16) is an improvement on the last. The lobby, it will be seen, is cut down to the smallest possible size, but the position of the doorways causes much unnecessary waste in the floor area of the ward.

An obvious sacrifice to the external architectural appearance

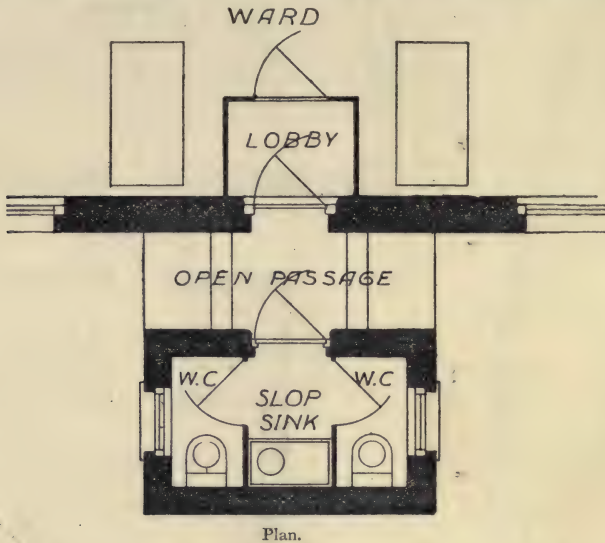


FIG. 18.

is to be seen at the Edinburgh Royal Infirmary (fig. 17), where the water-closets are placed in circular turrets at the angles of the ward. These circular turrets are a characteristic feature of Scotch architecture, and when forming part of an old castellated mansion are appropriate and of historic interest. But when they are reproduced in a hospital, the only effect is to unduly lengthen the size of the lobby and to lessen the chance of the cross-ventilation effecting its object.

The most complete severance of all atmospheric connection between the ward and the closets is attained when the intervening lobby is abolished altogether, and the closets are entered from the open air. This plan has been adopted at Homerton Fever Hospital

(fig. 18), where the communication between the wards and the closets is by a landing or bridge absolutely open at the sides, and protected only from the weather by a light wood and glass roof. It is only right to say that though, in this particular instance, the plan has worked entirely to the satisfaction of the medical superin-

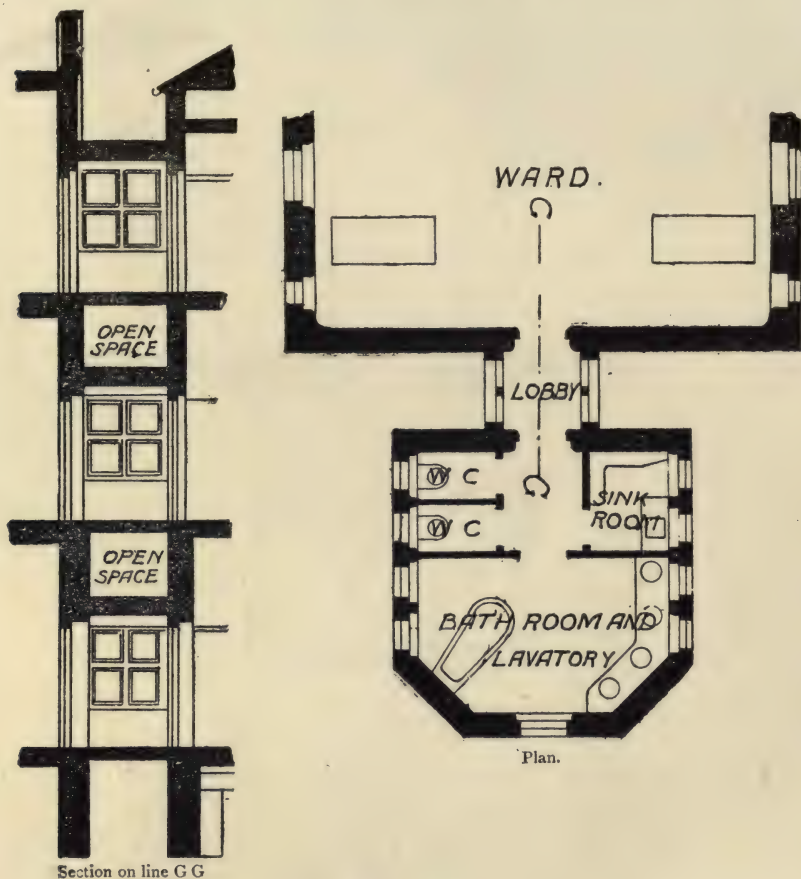


FIG. 19.

tendent, it is not one which commends itself to the judgment of every medical authority.

In several recently-built hospitals the form of the intervening lobby has been still further curtailed by reducing its height, so that in form it becomes a sort of covered bridge. The plan and section of the lobby and water-closets at the Great Northern Central

Hospital (fig. 19) illustrates this form. The object sought is to give as free play as possible to the air, so as to prevent stagnation in the vicinity of the ward. Similar arrangements are carried out at the New Civil Hospital at Antwerp, and at the Metropolitan Free Hospital, Kingsland Road, London.

With regard to the particular form of apparatus to be employed, some general rules may be laid down without pointing to any one form of apparatus in particular. In the first place, the mechanism for supplying water must be as simple in construction, as strong, and as nearly self-acting as possible. In order to prevent undue waste of water, it is necessary to limit the amount to be used at each flush. That amount must be sufficient to thoroughly flush out the basin and trap, and the mode of its discharge must be such that its volume is used to the greatest advantage. London water companies limit the amount of flush to two gallons, but this is not sufficient properly to flush out both basin and trap. Three gallons should be taken as the minimum, and the flushing cistern should be placed at a sufficient height above the basin and the connecting pipe should be of a sufficient size to utilise to the utmost the power of the water. It will be found that a minimum height of six feet above the basin and a pipe of one and a-half inches internal diameter will fulfil the required conditions. It has been said that the flushing apparatus should be "as nearly as possible" automatic. It would, of course, be better to have it entirely automatic, so that by the act of opening or shutting the door the whole volume of water is discharged. Various modes of doing this have from time to time been tried, and all have more or less failed. The mechanism is, as a rule, too complicated to stand the rough usage of hospital work. It remains, therefore, to put it out of the power of the user of the closet to modify the amount of the flush, and this can only be done by so regulating the apparatus that by one pull of the chain or lever which works the valve the whole of the contents of the flushing cistern are discharged.

The basin and trap should be of the simplest form, and entirely of white earthenware. Those forms which have the trap immediately under the basin are preferable to those in which there is a double bend, the lower part of the basin bending upwards and then downwards again into a trap below. In the latter form the water has double the work to do, and its force, therefore, is reduced by one-half.

In number the water-closets may usually be reckoned as one to every ten or twelve beds. This, however, must not be taken as

a hard-and-fast rule, as in a ward of twelve or fourteen beds one closet would not be sufficient, while in a ward of twenty-eight, as at St. Thomas's, two seem to be enough.

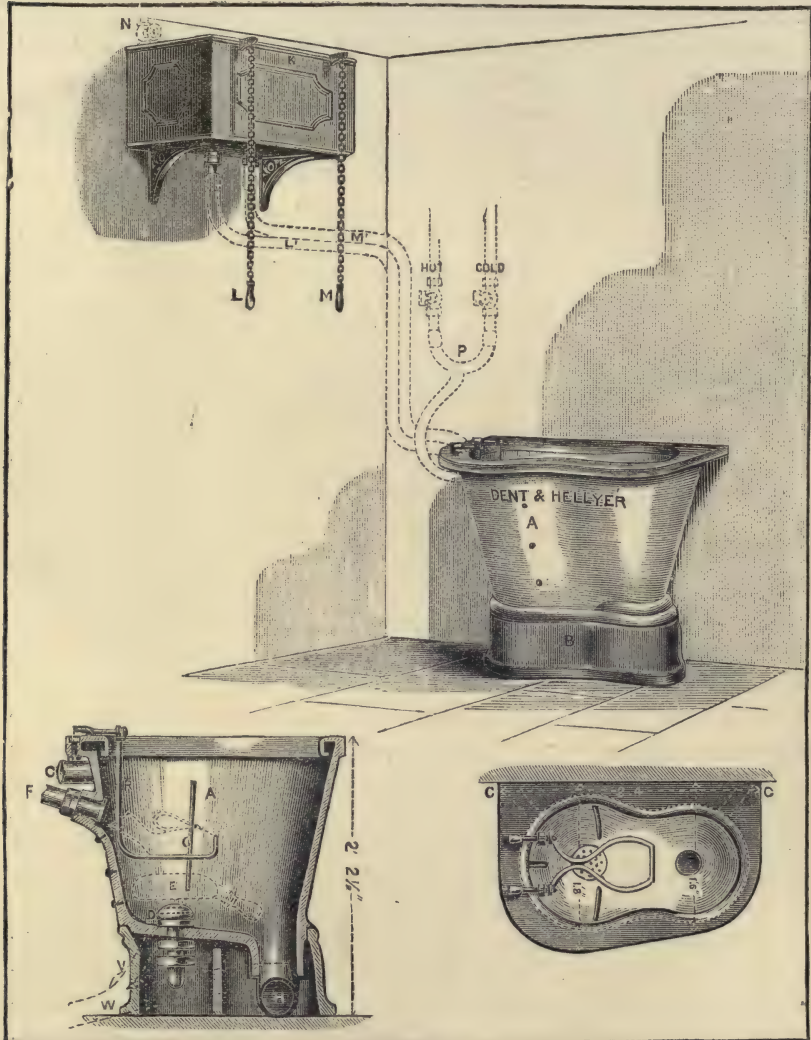


FIG. 20.

In close proximity to the closets should be a separate space enclosed for the slop sink, with provision for keeping bed-pans

and other crockery, and for brooms, and with a small cupboard, ventilated to the whole extent of its external side into the outer air, in which to keep fæces required for further examination by the medical staff. The hospital slop sink, or "sluice" as it is sometimes called, is a fitting that requires special care. The operation of emptying and cleansing bed-pans is one which involves no light risk to the nurse, whose duty it is to perform it, and necessitates the most scrupulous care on her part. The risk becomes a positive danger when the excreta of typhoid fever have to be dealt with, and the neglect of due care may lead to fatal results. The ordinary form of sink used for the purpose is either a large glazed porcelain receptacle or a copper basin, into which the bed-pans are placed, and a stream of water caused to flow over them from a tap fixed over the sink. In both, the bed-pan must be placed with the excreta exposed to the action of the water, and it is practically impossible to prevent the possibility of splashing. It is with the object of preventing this splashing, and of more effectually cleaning out the pan itself, that the slop sink, of which an illustration is given (fig. 20), has been devised. This sink, which is called the "McHardy sink" after its inventor, the well-known professor of ophthalmology in King's College, London, is made throughout of glazed fire-clay. In the section the position of the bed-pan when it is placed in the sink is indicated by the dotted lines enclosing the letter E. Just above the bed-pan is another set of dotted lines marked C, with an L-shaped arrangement suspended from the top. C represents an urine bottle, and the L represents a cradle in which the bottle is supported. The cradle is removable, and would only be fixed on when an urine bottle had to be cleaned out.

In emptying a bed-pan, the pan, being held by the spout, is turned over with the opening downwards, and rests in the position indicated in the section, being steadied by three strips of india-rubber, one at the back and one at each side. Immediately under the centre of the bed-pan is a perforated jet D, fed with cold water from the cistern K. By pulling the handle L a jet of water is projected upwards into the pan of sufficient quantity and force to wash the contents out through the neck and down into the waste pipe H, the pan itself being so firmly held the while that not a drop of water escapes, and the possibility of splashing is entirely avoided. The handle M works a valve by which water is admitted to the rim of the sink, and the sides are flushed down.

To clean out glass or china urinals the vessel is placed in the

cradle before referred to, and water, either hot or cold, or both mixed, is admitted by the nozzle F, which is exactly opposite the mouth of the urinal, by turning on the valves "hot" and "cold" shown on the walls by dotted lines. Thus the two principal dangers present in all ordinary slop sinks are avoided. First, the pan being inverted and flushed out from below, there is no possibility of portions of fæcal matter being carried about by splashing of water; and secondly, the necessary handling of the pan itself is very materially reduced.

Baths and Lavatories.—Although for convenience and economy of plumbing details the bath-rooms and lavatories are frequently placed with the water-closets in projecting wings, there is no necessity, as in the case of water-closets, for interposing a disconnecting lobby between the bath-room and the ward. The bath itself, which should be of glazed fire-clay, should be placed in the centre of the room and not enclosed in any way. The floor of the bath-room is best formed of cement or tiles, and a lattice wooden standing board should be placed around it. It is also desirable that there should be means of warming the bath-room either by hot water or by an open fire-place.

The lavatory basins may be placed in the bath-room, and should be in the proportion of at least one to every six or eight patients.

Ward Sculleries.—The ward scullery—or, as it is now usually called, the duty room—is the room in which the crockery used in the wards for patients' meals is cleansed, and in which some small amount of cooking is done. It need not be a large apartment, but should be of sufficient size to permit of two or three persons being at work in it at one time. In the duty room should be a sink with hot and cold water, a small dresser for holding plates, &c., with a place for saucepans, &c. below, and a small cooking range, with plenty of hot-plate space for keeping food warm.

Nurses' Rooms.—In the great majority of English hospitals a room will be found attached to each ward—often opening directly into, and always with a small window looking into, the ward—which serves the combined purpose of sitting-room and bedroom for the nurse or Sister in charge. While there is something to be said in support of the plan of giving a nurse a sitting-room next the ward, where she may see her own friends or people coming to see her on business, there is absolutely nothing to be said in favour of the practice of making a nurse sleep next her ward. In every well-ordered hospital when a day nurse goes off duty the care of her ward devolves upon the night nurse; and the day nurse should

then be entirely free from her work, and the anxiety and responsibility in connection with it. This cannot be if she is never to be out of the ward atmosphere. Upon this point of nurses sleeping away from their wards all the best hospital authorities are entirely in accord ; so much so, that in several recent instances the governing bodies of hospitals have erected separate and distinct buildings, self-contained in every respect, as homes for their nurses.

Isolation Wards.—Isolation or separation wards may be divided into two classes: (1) wards for cases that are, for their own sake or on account of their peculiar nature, better treated apart from the general wards—such as eye cases, cases of hysteria, or those which require special quiet ; and (2) cases which from their nature would endanger the health of other patients if treated in a general ward—such as infectious fevers, erysipelas, and dirty and offensive cases.

For the first class a small room close to the general ward is the most convenient arrangement.

For the second class the ward or wards need to be completely isolated from every other part of the hospital. They should be entered only from the open air, and should be provided with separate water-closet, duty room, and bedroom for a nurse.

Cupboards &c. adjoining wards.—One of the commonest complaints in new hospitals is the want of cupboard room. Whether this is the result of a want of knowledge on the part of the architect, or a want of co-operation between the architect and the medical and nursing staff, the result is much unnecessary friction, and a makeshift sort of appearance which might have been avoided by timely care.

Two things have to be carefully kept in view in arranging the adjuncts to a ward—1st, that *sufficient* cupboard room is absolutely necessary to the economical working of a ward ; and 2nd, that *too much* space is waste and is carefully to be avoided. In the words of the revered lady quoted elsewhere: "Every unneeded closet, scullery, sink, lobby, and staircase represents both a place which must be cleaned, which must take hands and time to clean, and a hiding- or skulking-place for patients or servants disposed to do wrong—and of such no hospital will ever be free. Every five minutes wasted upon cleaning what had better not have been there to be cleansed is something taken from and lost by the sick" (Florence Nightingale, "Notes on Hospitals").

Cupboards are needed in close proximity to each ward for (a) patients' own clothes ; (β) ward linen ; (γ) food ; (δ) medicines

and poisons. The old custom of providing baskets or lockers under the beds for the patients' clothes, though it still obtains in many hospitals, is a most objectionable one. The space under the bed stands in need of ventilation quite as much as any other part of the ward, and nothing should be allowed to impede the free passage of air. A sufficient storage space, therefore, for the clothes of all the patients in a ward, should be provided and fitted in such a way that the belongings of each patient can be kept separate. It is also desirable that, as far as possible, clothes should be hung up, not folded, in order to let the air pass freely through them. It need hardly be added that the clothes-cupboard should be very freely ventilated, and the walls should be washable. The cupboard for the ward linen ought to be large enough to hold a change of bed linen for each bed and a supply of draw-sheets; where it can be so arranged, both this and the clothes-cupboard should have hot-water pipes running through them. The food closet is necessary for keeping beef-tea, milk, bread, butter, and other things that either must be always at hand, or of which a day's supply are issued from the stores. The ice-safe should be either in or close to the food cupboard, which should be freely ventilated, well lighted, and not too large.

The cupboard for medicines should be in the duty room, and must, of course, be kept under lock and key, and under the sole control of the head nurse.

Space must also be provided for the coal bunk—which ought to be kept outside the ward—and for a basket for dirty linen pending its removal to the laundry. Shoots for dirty linen or ashes are things to be avoided; they rapidly become foul, and serve as shafts for the conveyance of polluted air from one ward to another. For bed or body linen that is fouled there should always be a basket lined with iron or zinc ready at hand, and in it the linen should be carried off at once, either to the laundry, or, if there be no laundry on the premises, to a shed or detached room containing a disinfectant tank—the lined basket being properly cleansed and disinfected before being sent back to the ward.

Balconies.—The use of balconies as adjuncts to wards is of quite recent date. One of the most notable instances is at the Bethany Hospital, Berlin, where broad balconies closed in at the ends by glass screens have been added to the wards. In these balconies many of the patients are kept in bed, not only during the day, but at night also. In connection with the boys' ward at

the same hospital there is a large square annexe covered by a span roof and protected at the sides with wood and glass, but entirely open at the end. At the Town Hospital at Dresden * two wooden summer-houses, each about 39 feet by 21 feet, have been erected in the garden. In the centre of the front wall is an opening 26 feet wide and extending up to the eaves. This opening is provided with a canvas curtain intended to be drawn in case of driving rain. Here patients are treated during the summer months, and are to all intents and purposes in the open air. At most of the older hospitals in the south of England, and at the recently-built hospital at Hastings and the Great Northern Central Hospital at Holloway, wide balconies are provided in connection with each ward, on to which patients are carried in their beds.

Flat Roofs.—In restricted sites, where there is little or no space available as exercising or airing ground for patients, it is useful to provide on the roof what cannot be got on the ground. The flat roofs at the two last-mentioned hospitals are instances of this. At Hastings a covered shelter has been erected on the top of each circular tower, with seats and screens to protect the patients from the wind. At the Victoria Hospital, Burnley, there is a large covered-in sun room on the flat roof approached by a staircase in the centre of the ward.

Barrack Wards.—Wards built of wood framing, and so constructed that the patients are practically in the open air except that they have a roof over their heads, are frequently to be seen in the gardens of hospitals abroad. They consist, as a rule, of a timber-framed one-storey erection, with panelled sides and openings for windows, which are provided with curtains but are without sashes or shutters. They are raised some two feet above the ground on brick or stone piers, the space under the floor being, except for the piers, quite open. They are used chiefly for children, and are occupied by night and by day as long as the weather permits. In some of the older hospitals, covered balconies have been built out from the wards for a similar purpose.

Examples of barrack wards are to be seen at the new hospital at Hamburg, Eppendorf, at the hospital at Basle, and at other places ; and examples of balconies covered in for the same purpose are to be found at the Civil Hospital, Berlin, and at the Ventnor Consumption Hospital.

* "Notes on Modern Hospital Construction," by P. Gordon Smith, *Practitioner*, June 1888.

Shoots.—In order to effect the speedy removal of dust and ashes and soiled linen from the neighbourhood of a ward, it is frequently found that shoots are arranged opening into the ward corridor at one end, and either into the basement or into the open air at the other. Such an arrangement must unhesitatingly be condemned. The condition of such a pipe—liable, as it would be, to be soiled by contact with the things thrown down—cannot fail to be a very grave source of danger and contamination to the ward air. The speedy removal of all waste and foul matters is unquestionably of the greatest importance, but it must not be effected at the cost of fouling the air. Attached to each ward there should be either an open air lift approached from a balcony, or a small crane by means of which the refuse or linen should be lowered in covered iron boxes. The labour involved in raising or lowering these receptacles would be reduced to a very small amount by the application of suitable mechanical arrangements.

Lifts.—The question of lifts also is nearly akin to that of shoots, inasmuch as a lift enclosed in a shaft becomes a duct for the passage of air from one floor to another. Lifts should always be so placed that no enclosure beyond the framing actually needed for support is required. The open well of a staircase is, as a general rule, a most convenient place, but if no other plan is available the lifts should be placed in the open air rather than in enclosed shafts. This latter plan is adopted at the Royal South London Ophthalmic Hospital, where three lifts exist all outside the external walls. The great perfection to which hydraulic lifts are now brought, and the perfect safety with which they can be worked, renders their adoption in most cases a matter of real economy.

Lighting.—The question of artificial lighting must naturally resolve itself to-day into one of the relative values of gas and of electricity respectively. It is perhaps premature to institute a comparison of cost between these two illuminants—partly because electric lighting cannot be said yet to have attained anything like perfection, and partly because the materials available for forming a just estimate are not sufficiently certain or sufficiently numerous. Upon one point, however, there can be no question. Electric lighting involves no demand upon the oxygen of the air in order to support combustion. Neither does it contribute in the slightest degree to the vitiation of the air. On the other hand, gas does both these things—without an adequate supply of oxygen it could not live, and in its process of (most imperfect) combustion it discharges into the

air a large proportion of unconsumed gas and of waste matter in the shape of carbon. For these two reasons, therefore—the greater purity of the air and the absence of dirt—electric light is more valuable than gas. But beyond this, the electric light is infinitely more convenient than gas. In two of the wards of the Middlesex Hospital which have recently, under the advice of the surgeons, been lighted by electricity, there is over each bed a fitting into which the wire from a hand lamp can be inserted, and the contact is made in a moment without even the turn of a tap. When the lamp is no longer wanted the wire is removed, the contact is broken, and the light is out. Such an arrangement as this is impossible with gas.

Temporary v. Permanent Wards.—It has often been urged, and with much show of reason, that the wards of a hospital should be merely temporary huts sufficiently stable to last for a few years, and that they should at stated intervals be entirely destroyed and fresh huts erected. In support of this view it has been urged that even in the most recent hospitals—designed presumably with all the care that modern knowledge could bring to bear, and arranged according to the most approved principles—the diseases which are attributed to impure air and insanitary conditions have appeared and reappeared. On the other hand, it is pointed out that in times of war the sick and wounded soldiers who have been treated in huts have fared much better than those treated in permanent buildings. This is unquestionably true, but, as Dr. Billings has pointed out,* it is equally true that the men in tents fare better than those in huts, which would be an argument in favour of tents in preference to huts. The arguments in favour of temporary structures for wards would carry more weight if it could be shown that it is impossible to build permanent wards which shall be capable of being kept permanently healthy. As a matter of fact this is exactly what cannot be shown; there is, on the contrary, no question that a ward can be so arranged, so constructed, and so administered as to be as healthy, or indeed more so than the best arranged hut. For, be it remarked, the very fact that the periodical destruction of these hut wards forms an integral part of the temporary system, involves the assumption that the hut must necessarily become unhealthy after the lapse of a certain period of occupancy. And so, no doubt, it would. Can there be a more absorbent material than wood? And if the unhealthiness of a ward is produced by the saturation of its walls with disease germs,

* "Johns Hopkins Essays." New York, 1875.

what form of ward would be more speedily liable to saturation than one built of wood? There are other objections to the hut form of ward, amongst which the danger from fire and the difficulty of warming are perhaps the most notable. It must also be remembered that the adoption of the hut form restricts the wards to buildings of one story only,—a most important point both with regard to cost of site and cost of maintenance and administration.

It has already been said that permanent wards can be so constructed as to be capable of being kept permanently healthy. The conditions which should govern the internal construction of a ward have already been detailed; but a point which concerns the healthiness of the ward in a very vital way, and which has not yet been referred to, is the connection between the ward and the staircase and corridor which forms the common access to one ward and several others. The one main principle to be kept in view is the complete isolation of each ward with its own offices from atmospheric communication with any other ward, or indeed any other part of the hospital. The evils of free interchange of air between all parts of a hospital were forcibly pointed out nearly twenty years ago by Professor Erichsen in his lectures on "Hospitalism" to the students at University College Hospital. Speaking of the large class of hospitals, varying in size from 100 to 300 or 400 beds, and mostly built about the beginning of this century, he said: "They are simply big houses, with basements containing kitchens, sculleries, cellars, and the ordinary offices of a large establishment; with an operating theatre and dead-house more or less closely connected with the main building; with every floor filled with sick and injured people. On the ground floor, accidents and operation cases; on the first floor, probably medical patients; above, chronic surgical cases—who can wonder at the development of pyæmia below and erysipelas above? . . . The evil of this mode of construction is very great. It leads to the upper storey, which ought to be the healthiest, being usually the most infected with septic disease, and this notwithstanding its being more easily ventilated than those lower down."*

Each ward, then, should be so separated from the main corridor and from the staircase that neither the one nor the other can become a carrier of infection from one ward to another. And equally as a matter of course, the out-patient department, the

* *On Hospitalism*, by John Eric Erichsen, F.R.C.S., &c. &c. London, 1874.

kitchen offices, the mortuary, and the laundry should be entirely isolated from the wards. The most effectual way of doing this is exemplified in many recent continental hospitals, where the various buildings are all detached, and not even connected by covered ways. This system has found no favour in this country, nor is it apparently likely to be adopted. But the required separation can be obtained effectually by the interposition of a lobby between the ward and the corridor or staircase, the lobby being provided with free cross-ventilation at the sides. This, so far as the immediate connection between ward and corridor or staircase is concerned. Provided, then, that each ward is effectually isolated from the main channels of communication between the various parts of the hospital, and from aerial connection with any other ward; that the out-patient department, the laundry, the mortuary, and the kitchen offices are all placed in separate and detached buildings; and that all corridors of communication are, if not absolutely open at the sides, provided with the freest possible ventilation, the conditions under which the patients are treated so far as the structure is concerned may be regarded as equally safe as if they were housed in absolutely detached buildings.

Intimately connected with the subject of the planning of the wards in relation to other parts of a hospital is the question of the number of stories permissible in a ward pavilion. It has of late years been much advocated, especially in Germany, that wards should be of one storey only, and in many recent hospitals, notably those built on the Tollet system, this principle has been uniformly adhered to. Such a system, however great its theoretical advantages, is obviously impossible in large towns where land is valuable; and it must also be much more costly in point of administration than the ordinary arrangement of two- or three-storey wards. The question then arises,—Can a ward which has one or two other wards superimposed be regarded as equally healthy as a ward of one storey only? In endeavouring to answer this question the extreme difficulty of making an exact comparison must be carefully kept in view. For it must be remembered there is no possible means of instituting a comparison between two hospitals, or even two wards, in which all other conditions except that of the number of stories shall be alike. With this reservation, then, the first question to be asked is, Upon what grounds are wards of more than one floor in height condemned? Surely this, that in such buildings as some of the older London hospitals, or in the old Hôtel Dieu at Paris,

to cite an extreme example, the constant recurrence of septic diseases was found to be due to the intimate connection between the wards and all other parts of the building, including not only kitchens and out-patient departments, but laundries and mortuaries. Since, as would naturally be expected, it was found that the wards on the upper floors, although most favourably placed for ventilation, were those that suffered most from septic poison, the conclusion was arrived at that upper-storey wards were, *per se*, unhealthy. That this conclusion was of too sweeping a nature is practically proved by the fact that in many hospitals of the kind referred to septic diseases have been practically abolished by judicious structural alterations, by careful attention to sanitation, and by good administration.

Heating and Ventilation in American Hospitals.—In American hospitals the methods of heating and ventilation differ according to climate and locality, the age of the building, and the knowledge of the architect. The great majority of the hospitals in the large northern cities are heated by steam, on the system usually known as that of indirect radiation, so far as the wards are concerned. By this method the radiators, composed of coils of wrought-iron pipe, or of cast-iron boxes of various patterns, receiving steam by mains from a central boiler, are placed in the cellar, being usually encased in tin-lined or galvanised sheet-iron boxes placed near the ceiling against the piers between the windows. The outer air is admitted to these radiating boxes either through the cellar windows, or by means of special ducts of wood, tin, or galvanised sheet-iron, constructed for the purpose. The top of the radiator-case communicates with flues built in the outer wall, and leading up into the wards or rooms above, and opening into them through wall-registers placed about a foot above the floor. In the Barnes Hospital these fresh-air wall-flues are constructed of terra-cotta pipe built into the wall, but they are usually lined with tin. To secure satisfactory results by this method of heating, the steam mains should be large, and the pressure at the boilers should not exceed two pounds under ordinary circumstances. An excellent example of well-arranged work for this kind of heating may be found in the Boston City Hospital, and the hospital at the Soldiers' Home at Hampton, Virginia, is also a good specimen of careful adjustment of this method to the ends desired.

In the majority of cases, however, the steam-heating apparatus for hospitals, as for most other large buildings, gives more or less unsatisfactory results as regards ventilation when the temperature

of the external air ranges from 40° to 50° Fahr., because the rooms become over-heated if the requisite supply of fresh air is admitted. This is due to the fact that architects and heating engineers usually do not provide means for regulating the temperature of the air entering through the fresh-air registers. This air has just passed over the surface of the steam-heated radiators, whose temperature cannot be lowered without cutting off the steam-supply and thus preventing all warming of the air. The air which has passed over steam-heated radiators will have a temperature of from 100° to 150° Fahr., and when this makes the room too warm for comfort the only resource, with the ordinary forms of apparatus, is to cut off the supply of fresh hot air by closing the register. The methods used in English hospitals to admit the fresh, cool, external air directly into the ward, the currents being directed upward towards the ceiling by means of Sheringham valves, Tobin's tubes, or other similar contrivances, are very rarely employed in American hospitals, the windows and doors being practically the only openings available for such a purpose.

The temperature maintained in hospitals in the Northern States during the winter months, like that in the houses and hotels, usually seems excessively high to an English observer, for it is, as a rule, 70° and sometimes 75° Fahr., while at the same time the air is very dry. No doubt the general dryness of the air in these localities, as compared with the much moister atmosphere of England, makes it necessary to heat rooms five or six degrees of Fahrenheit higher, in order to prevent complaints of cold on the part of the inmates; but habit has also much to do with this matter, and it is probable that the temperature in American houses and hospitals which are heated by furnaces or by steam is often several degrees higher than is requisite or desirable for the health of the inmates. The rapid and great variations in temperature which often occur in spring and autumn also increase the difficulties in the way of maintaining a constant suitable temperature, and tend to produce over-heating, since, when the temperature of the outer air in the morning is 45°, and at noon 65° or 70° Fahr., a general system of heating tends to make the walls and ceilings too warm to be comfortable in the middle of the day.

Open fireplaces or fireplace stoves are often seen in wards; but very little reliance is placed upon them for heating purposes, their chief use being as adjuncts to the ventilation.

The proper way to avoid the difficulties above referred to as connected with the use of a steam-heating plant is that pursued in

the Boston City, the Massachusetts General, and several smaller new hospitals—namely, so to arrange the radiators that the incoming fresh air can be taken either through or around them, or partly in one way and partly in the other. By this means the temperature of the air as it enters the ward can be regulated to a great extent without interfering with the amount of the supply, and this is one of the most important points to be borne in mind in all systems of heating in which the incoming air is the carrier of the heat, and especially in steam-heating by indirect radiation. With direct radiation the difficulties in securing satisfactory ventilation with comfortable heating become still greater, and the ventilation is usually sacrificed.

Where an attempt is made to secure a cheap steam-heating plant by giving the work out by contract to the lowest bidder, with the simple specification that the apparatus must be competent to warm the building throughout to 70° Fahr. when the external temperature is zero, the results are invariably unsatisfactory. Under such circumstances, the contractor who makes the lowest bid will as far as possible place his pipes and radiators directly into the room which is to be warmed, the usual method in American hotels, and will rely on high boiler pressure to force the steam through mains and pipes of insufficient size.

If the fact be borne in mind that during the winter months, in the northern hospitals of America, nearly all the air required for ventilating the wards must be warmed to a comfortable degree before it is admitted to them, and that to secure satisfactory ventilation at least 3,000 cubic feet per hour are required for each bed, it will be seen that the flues, registers, and radiators provided must be large—much larger, in fact, than those which most architects, heating contractors, or hospital governors seem to have considered necessary.

It is very desirable that the steam radiators in hospitals should be kept at as low a temperature as is consistent with the fact that live steam is to be passed through them, and therefore this steam is to be kept at a low pressure, which requires large mains and free returns.

Two American hospitals furnish good examples of the system of heating by hot water circulating in pipes at low pressure. One of these, the Barnes Hospital, at the old Soldiers' Home near Washington, is a small one, designed for only fifty beds, although as a matter of fact it has usually had more than this number. This hospital was planned by Dr. Billings about twenty years ago, and the use of hot water as a means of heating was then quite a new thing

in American hospitals. The results obtained were so satisfactory that the hot-water system of heating was adopted in the plans for the Johns Hopkins Hospital in Baltimore, where it is carried out on a very extensive scale, as will be seen by reference to the description of that institution.

The great advantage of low-pressure hot-water heating by indirect radiation as applied to hospital wards is, that it is possible by comparatively simple arrangements to keep the radiators at the precise temperature required to warm all the in-coming air enough, and no more than enough. This is effected partly by regulating the temperature of the water in the boilers and large mains, which may vary from 100° to 180° Fahr., and partly by regulating the velocity of the flow of the heated water through a particular set of radiators, or even through a single one, and thus securing local control of their temperature.

With steam all the radiators must practically be at about the same temperature, especially if they are small, and the heat can never fall below a certain point if they are to be heated at all; hence the only way to reduce the temperature of the air which has passed over them is to mix cold air with it by means of a by-pass or some form of mixing chamber. The air from hot-water radiators can never be heated to such a degree as to scorch any organic matter which it may contain, and thus to produce the peculiar disagreeable odour which is familiar to all who have had much experience with buildings or rooms heated by high-pressure steam. The action of the apparatus is more equable and regular than that of a steam-plant, being less dependent on constant and skilled firing; and the cost of its fuel is somewhat less than that for steam, because the gases of combustion escape into the chimney-shaft at a lower temperature, and therefore waste less heat.

When employed in the indirect method it requires the constant introduction of a large quantity of air to secure comfortable warmth, and therefore ventilation is necessary to a much larger extent than when steam is employed. When the radiators are placed in the rooms to be heated, as is commonly done in halls, bath-rooms, lavatories, &c. (that being the method of direct heating without admission of warmed air), ventilation is of course not promoted in the same way, but the heat thus obtained is more agreeable than that derived from steam radiators placed in a like manner. Sometimes the hot-water or steam radiators are placed in the window breasts, and are so arranged that air is admitted to them through an opening

beneath the window sill, thereby forming the so-called method of direct-indirect radiation. It is, however, very difficult to admit the requisite amount of air by this arrangement and at the same time to prevent occasional cold draughts. The system is not well adapted to hospital wards.

The employment of water heated by steam, which is the principle of the so-called hot-water stoves, is unknown in American hospitals, and the admission of fresh air through radiators placed in the centre of the ward is only to be found in some of the military hospitals in which jacketed stoves are used as the radiators.

The disadvantages of hot-water heating for hospitals in the United States are that the cost of installation is greater than that of any other mode of heating, that it occupies more space in the cellars or basements where the radiators are placed, and that, as it is not often used, there are fewer mechanics who are competent to make repairs and alterations in it, and more difficulty in obtaining the proper fittings than is the case when steam is employed. It requires more skilled workmanship than does a steam-plant, but involves much less risk of careless execution.

Stoves are used for heating in some of the older American hospitals, and in the smaller army hospitals, where it is common to surround the stove with a sheet-iron jacket, between which and the stove itself fresh air is brought in through an opening in the floor.

Furnaces are used in a few small hospitals, but the results are not satisfactory as regards ventilation, especially in cold weather, and the heating is very liable to be affected by the direction and force of the wind.

It is with regard to provision for, and methods of ventilation, that the greatest differences exist in American hospitals. In the Southern States and in California the windows can be opened freely except during a very few days in the year, so that perfation is secured whenever there is any wind ; but at times the external air is almost absolutely still, and on such occasions, when the temperature is 85° Fahr. or upwards, the odour due to accumulation of exhalations from the bodies of the patients is sometimes unpleasantly perceptible, especially in the wards for coloured patients. Under such circumstances the difference between the temperature of the air in the ward and of the external air is not sufficient to cause currents of much velocity ; and it is not usual in hospitals in these localities to provide mechanical arrangements for producing or accelerating the movement of the air through the wards.

In recently constructed hospitals in the Northern States, special aspirating shafts or chimneys are usually provided in connection with the wards. In the Johns Hopkins Hospital each of the common wards has such a shaft, in which is placed a steam coil or a ring of steam-pipes to accelerate the upward current. In winter these accelerating coils are not usually needed, since the difference in temperature between the air in the wards and the outer air is quite sufficient to secure the required velocity of current in the outlet shaft; but whenever the temperature of the external air is 60° Fahr. or upwards, especially if there is little or no wind, these accelerating coils are found to be very useful.

A propelling fan, which forces air into the wards, through a system of ducts connected with the heating coils and fresh-air registers, is used in the Barnes Hospital, and has been found to give excellent results. It is employed for a short time in the morning and in the evening to flush out the wards with a large supply of fresh air, and by this means the average carbonic impurity of 2 per 10,000 can be reduced in fifteen minutes to less than 0.5 per 10,000, and a sensation of out-door freshness be produced which is very grateful to the inmates. It is also used on hot, still days to secure a constant movement of air in the wards.

A similar fan is connected with one of the common wards in the Johns Hopkins Hospital, and arrangements are made for placing the same apparatus in the other wards if it is found desirable to do so; but thus far this fan has been used for experimental purposes only, since the accelerating coils in the shafts have been found to produce the desired effect of keeping the air in the wards fresh, and free from odour.

In small wards, and in rooms used for private patients, the open fireplace with an ordinary chimney-shaft is used to secure the exit of air. In some hospitals, as in the Episcopal Hospital in Philadelphia, a fireplace is placed in each corner of the large wards; but the expediency of such an arrangement is doubtful, since the fires are apt to draw against each other, and one or more of them may at times act as inlets and cause smoke to pass into the room. In wards of one storey only, it is common to place the openings for the exit of foul air in the centre of the ceiling, this being the arrangement in the one-storey wards of the Boston City Hospital, and in the wards of the army port hospitals. In the New York Hospital the registers for the exit of fouled air are placed in the floor, one beneath each bed, and from these openings horizontal

flues beneath the floor lead to the vertical foul-air shafts built in the thick outer walls. In the Johns Hopkins Hospital a double set of exit registers and ducts is provided. One of these has openings in the floor beneath each bed, as in the New York Hospital, but these openings connect with a central longitudinal duct of galvanised iron which is suspended from the ceiling of the basement, and passes to the central aspirating chimney. The other set opens along the centre of the ceiling into a similar longitudinal duct in the attic, which also leads to the aspirating chimney. In the Barnes Hospital the same double arrangement of foul-air ducts exists, but the floor-openings are along the centre of the ward instead of being beneath the beds. This simplifies construction, but it is very difficult to keep the registers and the ducts beneath them in a cleanly condition at all times, since the patients are apt to use them as spittoons. The object of this double system of outlets is that the floor outlets may be used in cold weather for the purpose of economising heat, while in summer both sets may be freely opened. In hospitals which have two or more stories the foul-air flues are commonly placed in the outer walls, but this arrangement often proves to be unsatisfactory in cold weather, since the current in the flues is checked by the chilling of their walls. It is usual to provide two sets of openings with registers into these lateral wall-flues—one above near the ceiling, and the other below near the floor.

In the first pavilion constructed for the hospital of the University of Pennsylvania, an attempt was made to ensure a constant current in these outer wall-exit flues, by placing their openings just beneath the in-coming hot-air registers, so that the lower end of the exit-flue might be heated by the hot-air duct lying against it. The results have not been satisfactory, and the system is about to be changed.

THE OPERATION ROOM.

In all hospitals where surgical cases are received and operations are performed, a special room, or rooms, will be required for this purpose; in many large hospitals two, and sometimes three, operation rooms are provided, one being arranged in the form of a theatre, and provided with accommodation for a considerable number of students. In all cases the main requirements are practically the same. In the first place, an operation room must be so placed as

to be within convenient access of the wards, while being as far as possible severed from aerial contact with them. It should be so situated with relation to adjoining buildings that it is neither overshadowed nor overlooked by them, and it should be well open to free access of light from the best aspect at the north. The perfect separation of the operation room from all other parts of the hospital has been in some French hospitals carried to so great a length as to render it necessary to carry the patients through the open air on their way from ward to operation room. This is the case at the hospital at Chartres, where the operation room is fifty yards distant from the main building. This room was built in 1886-7, in accordance with a scheme prepared by M. Maunoury, a surgeon. The building contains, besides the operation room, a small room in which grave cases, which require rest and warmth after an operation, can be placed; this room leads out of the vestibule to the operation room. The operation room itself is about 15 feet by 18 feet, and about 12 ft. 6 in. high. All the angles are rounded, and the window-frames flush with the inner surface of the walls. The tables, pipes, tops of sinks and other fittings are kept clear of the wall by at least one inch. The whole of the room and all its contents are of materials that can be washed freely with water. The walls, ceiling, and floor are finished with Portland cement and painted. The lavatory and sink-tops are of glass, as are also the shelves for dressings, instruments, &c.

The patients are carried to and from the operation room in a specially devised litter, which is closed, and can be warmed when required. Such an arrangement as this is carrying the principle of separation to an extreme point; and it may well be doubted whether it is altogether justifiable. Certainly such a plan could not be adopted in most of our large town hospitals, and if it were possible it would hardly commend itself to the approval of the medical profession. Apart from the special point of complete detachment from the main building, the construction and fittings of this operation room have been designed with a care and thought which merit every praise.

Assuming, then, that in this country at any rate the operation room must be in communication with the wards by a closed corridor, every possible precaution must be taken to prevent contamination of the air of the operation room from any other source. By the effectual separation of the kitchen offices the out-patient department, the laundry, and the mortuary, and by as far as

possible severing the aerial connection between the wards and the corridor in the manner described above, much will have been done to effect this. To further isolate the operation room, it should, together with its adjacent room or rooms, be placed in a separate wing connected with the main corridor by a similar lobby to those leading to the wards. Within the operation room itself every detail should be devised with a special view to its aseptic nature. Everything of an absorbent nature should, as far as possible, be eliminated. In a room intended for operations only, and not for the accommodation of students, the accomplishment of this is simple enough.

A description of the operation room at the Derbyshire Royal Infirmary as reconstructed in 1889 will afford a fair example of what may be done to attain a condition of almost perfect asepticism. The old operation room, together with an anteroom adjoining, formed the upper floor of a projection from the main building, the ground floor of which was occupied by the chapel, with the kitchen offices in the basement below. The operation room was in the remodelling reduced in size from 23 ft. 6 in. by 20 feet to 21 feet by 16 feet, and the remaining space was divided into a small room for instruments and a room in which to administer anæsthetics, or, when necessary, to accommodate patients after an operation. The whole of the old flooring was taken up and destroyed. The operation-room floor was laid with "mischiati" mosaic laid on a bed of concrete. The surface of the floor is finished with a slight fall to a point near the external wall, where an iron pipe passes through the concrete and is connected to a lead pipe on the outside, which, in its turn, discharges over an open trap. The iron pipe referred to is enamelled white inside, and the opening in the floor is fitted with a gun-metal plug and socket flush with the marble surface. Around the walls at the floor line is a marble skirting hollowed out to a radius of $2\frac{1}{2}$ inches, and above this the walls are lined with marble to a height of 7 feet. Above the marble the walls are finished with Keene's cement, and the ceiling, which is in the form of a flat vault, is plastered. Both walls and ceiling are painted and varnished.

There are four windows, one facing north and three facing west. The north window is the principal light, and is formed of one sheet of plate glass 10 feet by 8 feet fitted in a wrought-iron frame which is fixed on the inside of the wall; and flush with the marble wall lining above this window is a skylight 6 feet by 8 feet, also made of wrought-iron and glazed with plate glass. The three windows on the west side are formed in a group with stone mullions dividing

them, the two side-lights being narrower than the centre light. The frames of these windows are constructed in a similar way to the other, but are made to open for the purposes of ventilation.

The doors which are made in two leaves are of sheet-iron in a wrought-iron frame, and on the inside are made quite flush. In front of the three-light window are two sinks and a lavatory basin, all of white porcelain, carried on iron brackets fixed into the wall, and having plate-glass tops. All these fittings, with their tops, and all the pipes are fixed clear of the wall, the least distance allowed being one clear inch.

Ventilation at the floor surface is provided by shafts through the wall, fitted on the inside with Ellison's radiator ventilators made of iron, and on the outside with terra-cotta air gratings.

Two circular hot-water coils with plate-glass tops provide the requisite means of warming. Artificial light is provided by a three-light "Cromartie" gas lamp, above which is fixed a ventilating tube which ascends through the roof and is capped by a "Monarch" ventilator.

Glass has been suggested as a material for lining the walls. Theoretically, it is as perfect a material as can be imagined. Practically, the difficulties in applying it are prohibitory. The slightest settlement in the walls would be sufficient to cause a fracture; and the difficulty in fixing it would be very great indeed. For tops to sinks and basins and for shelves it is most valuable, as, besides being absolutely impervious, its transparency enables any uncleanliness of the under side to be instantly detected. Glass has also been used in the construction of operation tables; in the Paris Exhibition of 1889 several tables of various sizes were shown with the tops of plate glass. Several of these tables are in use on the Continent, one being found at the St. Olga Children's Hospital, Moscow.

From what has been said it will be seen that the important end to be kept in view in arranging an operation room is that every part shall be impervious, readily cleansed, and easily seen. The following notes on the subject by Dr. Billings will be read with interest, as setting forth the views of one of the most eminent authorities on hospital matters in America. One remark may be permitted in regard to what Dr. Billings says of wall surfaces. In London at any rate—and the same probably holds good of most large provincial towns—no surface of plaster or cement and paint is proof against the atmosphere with which we have to deal, and marble has this advantage, that it requires no skilled labour to

clean, and needs no periodical renewal. Painted surfaces, on the other hand, must, if they are to be kept impervious, be renewed at intervals.

"An Ideal Operation Theatre.—An ideal operating theatre in a hospital would be a comparatively small room, say 20 by 30 feet, and 15 feet high. It would have no provision for mere spectators. It would have a single large window from 8 to 12 feet wide, and extending from 4 feet above the floor to the ceiling. This window would usually be best placed with a north aspect. It would also have a skylight about 8 feet square. The floor should be of marble tiles, or of scagliola, the walls with enamelled bricks, or covered with sheets of glass, or of enamelled slate. The ceiling should be thoroughly painted. Such floors, walls, and ceiling are theoretically those best adapted to secure smooth impervious surfaces which can be easily cleansed or disinfected. Practically, well-painted plaster walls and well-laid hardwood floors, especially if saturated with paraffin, give quite as good results, for the dangers of contamination of wounds made in operating come chiefly from the persons and clothing of those present, especially the patient and the operator and his assistants, and from the instruments, apparatus, and dressings.

"The room should have two 100-candle power electric lights, with reflectors which can be set at any angle. Also two portable incandescent lamps with flexible connections so that they can be brought close to any part of the operating table. Electrical connections should also be furnished on each side of the room for wires for galvanocaustic instruments, electrolytic work, and ordinary galvanic and faradic currents. The furniture of the room should consist of the operating table, of shelves and racks, and basins and trays.

"The operating table may be of iron, or of wood thoroughly saturated with paraffin. The shelves should be of glass or slate; the basins and trays should be of porcelain and glass; the racks of iron. The operating table should not be fixed in one position in the room, and it should not be in any way connected with the general drainage system of the building. If the room is constantly in use, and the drainage system of the building is satisfactorily constructed, fixed porcelain basins and a porcelain sink may be placed in the room and allowed to connect with it, but these should have no overflows by sink passages in the body of the fixtures themselves. Where there is any doubt about the drainage, the

bowls and sinks should discharge into vessels which can be removed. Hot and cold water should be supplied for the bowls, and cold water for the sink. There should also be an apparatus for the supply of fresh distilled water. The room may be heated by either direct or indirect radiation from steam coils. The fresh-air supply should be filtered through a thin layer of cotton batting before it is admitted to the room. About 10 cubic feet per second will be required for a room of the dimensions above given, it being understood that there should never be more than twenty persons in it at one time. The outlet flue should have an area of two square feet, with an opening into it of the same dimensions near the floor of the room. The greater part of the instruments, with the apparatus for sterilising them, should be kept in a separate but adjacent room."

In addition to the operation room itself one or more adjoining rooms are required. An ante-room for the medical staff, or surgeons' room, is a necessity even in the smallest hospitals; it should be fitted with a lavatory, and sometimes contains the instrument case. A better arrangement, however, is to have the latter within the operation room itself. In most large hospitals where there is a medical school it is desirable to provide a room for the administration of anæsthetics; in addition to this is sometimes provided a room in which a patient can be kept until sufficiently recovered to be removed to his ward.

Separate operation rooms may also be required for gynæcological operations and for eye operations—for the former, because the precautions to be observed in operations involving abdominal section are of such a kind that the conveyance of a patient to and from the general operation theatre is considered undesirable; and for the latter, because a large theatre lighted from the top only, as is generally the case, is practically useless for eye operations, which require a vertical light.

THE LAUNDRY.

The hospital laundry should be a detached building, and need not be connected with any other part of the hospital even by a covered way. In many of the older hospitals the laundry is still to be found in the basement, frequently underneath the wards. It need not be said that such a plan is in every way to be deprecated. For the patients, such an arrangement is fraught with danger, owing to the extreme difficulty of preventing the steam, laden with

organic impurities, from ascending to the wards above ; and for the laundry itself, because a laundry so placed is almost certain to be dark, badly ventilated, and altogether unfitted for its purpose. In one large London hospital, St. Bartholomew's, the whole of the washing is done at the laundry attached to the Convalescent Home at Swanley, and the double advantage is gained that the washing is done in the pure country air, and the laundry is right away from the hospital. But this is an arrangement which is possible only in the case of a fortunate few, and those hospitals which are not so favourably endowed must still continue to have their washing done on the premises.

The hospital laundry in its simplest form should consist of a washhouse and an ironing room, to which should be added, where circumstances permit, an open-air drying ground. In large establishments there should be a room for the reception and sorting of the soiled linen, and another one for the sorting and delivery of the linen when clean. A separate washhouse and ironing room for infected linen is sometimes required, and in infectious hospitals separate accommodation is required for the officers' linen.

The construction of the laundry throughout should be of a simple character, with light and readily cleansed surfaces ; for the walls white glazed bricks, and for the floor cement or artificial stone should be used. The floor of the washhouse should be laid to regular falls, and the whole of the drainage, whether from the floor or from the apparatus, should be received into open channels covered with perforated iron gratings, and passing out to an open trap or traps outside the external walls. Or it may be all led into a flushing tank, whence it can be discharged in a body into the drains. The apparatus needful in the washhouse will consist of a washing machine, hydro-extractor, steeping tank, boiling copper, washing troughs, soap boiler, and rinsing and blueing machine; these, of course, in number and size proportionate to the work to be done.

The drying chamber should be placed between the washhouse and the laundry, and should be provided with horses fitted with galvanised iron rods, and moving on wheels on overhead runners. The chamber should be heated by steam pipes, and should be well ventilated ; a neglect of this latter precaution causes the steam evaporated from the clothes in the process of drying to be condensed and to fall on the clothes. In large laundries it is advisable to have some additional provision of drying horses for airing linen after it has been ironed.

The ironing room should contain, besides the necessary provision of ironing benches, a mangle with the rolling-in table.

In close proximity to the laundry the boiler house and engine room should be placed. With the question of the construction of boilers or engines it is obviously not within the province of the present work to deal; but there are some points in connection with this part of the subject which it is well to mention. In the first place, economy of maintenance should always be carefully kept in view in the consideration of each and every part of a hospital, and in no department is it more needful to think of this than in the engineering work. Excellence of construction in a boiler means not only the perfection of workmanship but the greatest possible economy of fuel; and in laying down boilers it is good economy in the long run not only to seek the best possible workmanship, but also to obtain and act upon competent professional advice in their design. The carrying out of works of hot-water engineering is too often entrusted to the firm who make the lowest bid; and as a consequence the work is done in the flimsiest and most unintelligent fashion. It is difficult to convince a committee that a boiler costing fifty pounds will prove far more costly for fuel than one costing double that sum; and that, moreover, the lower-priced boiler will not live half or a third as long as the more costly one. But such nevertheless is a fair statement of the difference in economic value between good and bad work. Another point to be thought of in arranging the service of hot water and steam in a hospital is economy of service. How often do we see scattered here and there in a large hospital four or five or more boilers, each of which has to be attended to at regular intervals! Such an arrangement is unintelligent and wasteful to the last degree; and it only exists because those to whom this sort of work is usually entrusted are ignorant of the first principles of the work. If instead of a series of small boilers, each supplying hot water to its own separate section of the buildings, the whole of the water required were heated by steam supplied from one central boiler, the expenditure for fuel would be reduced and the time wasted in going to and from the several boilers would be entirely saved.

DISINFECTING HOUSE.

In all hospitals a disinfecting apparatus of some kind is a necessity, both for the purpose of destroying vermin in clothes and for disinfecting bedding &c. after cases of infectious disease. So far

as present knowledge of the subject goes, the only trustworthy process is the application of steam under pressure, aided and supplemented by dry hot air. The great value of steam under pressure is its penetrative power, and the failure of the older forms of dry-heat disinfectors was due to their want of this power. The difference between the two heat agents may be best illustrated by two examples taken from Dr. Parsons's Report on Disinfection by Heat.* Spores of *bacillus anthracis* required for destruction four hours' exposure to dry heat at 220° Fahr., but were destroyed by five minutes' exposure to a heat of 212° Fahr. in steam or boiling water.

The temperature required to destroy the contagion of ordinary infectious diseases is stated by Dr. Parsons to be for dry heat 220° Fahr., with one hour's exposure, or 212° Fahr. for steam, with five minutes' exposure. In any case it is not desirable to exceed a temperature of 250° Fahr., and this is considered too high for white woollen fabrics.

An efficient apparatus should provide means of subjecting the articles to be disinfected to actual contact with high-pressure steam, and of drying them with hot dry air before the steam can condense sufficiently to injure them; and should be provided with means of automatically shutting off steam if the temperature should exceed a certain point.

Whatever form of apparatus be adopted, it should always be provided with two doors, one for ingress, the other for egress; and the apparatus should be fixed with the ingress door in one room and the egress door in another, the two rooms being divided by a solid wall.

MORTUARY AND POST-MORTEM ROOM.

Of the paramount necessity for completely isolating these offices from anything approaching near proximity to the wards there can be no question. But on the question of whether there should be any covered communication between them and the main buildings opinions differ. In support of the desirability of the covered way it is urged that the necessity not infrequently arises for carrying bodies from the wards to the mortuary in rainy or snowy weather; and also that the medical staff must go to and from the post-mortem room in all kinds of weather whenever duty calls them thither. On the other hand, it may be pointed out that

* *Fourteenth Annual Report of Local Government Board*: supplement containing the Report of the Medical Officer for 1884.

it is perfectly easy to take proper precautions to ensure the decent transport of bodies to the mortuary whatever the weather may be ; and that it is no great hardship for the medical officers to have to traverse a few yards of open space even in the worst possible weather. For, if the mortuary building be placed, as it should be, in the remotest corner of the site, the arrangement of a covered way will generally be a matter of considerable difficulty and expense, while the condition of absolute isolation is a matter of such vital importance that no considerations of personal comfort or convenience should be allowed to weigh for a moment.

In the large hospitals of great cities where the site is encumbered with buildings and there is, as sometimes happens, little or no vacant space, it is impossible to isolate the mortuary in this way. It then becomes a question whether the best place may not be the top of the building rather than, as often occurs, the basement. If such a position is chosen—and it has much to recommend it—there must be a lift for conveying the bodies up and down ; and this lift must be entirely outside the building, and should be enclosed only with such lattice framing as may be necessary for the support of the guides and the working parts. At its lowest point the lift should open into an open courtyard, and access to it should be through the open air only. A staircase will also be required in addition to the lift, and this also should be approached from the open air only, and should not in any way communicate with the interior of the hospital. Arranged in this way, a mortuary and post-mortem room may be placed at the top of the hospital building, and yet be as completely isolated as if it were at the remotest part of a large open site.

In most hospitals, except those of the smallest kind and those, such as eye hospitals, where the mortality is small relatively to the number of patients, the mortuary should consist of two rooms—one a general dead-house where bodies are received, washed and prepared for burial, the other a smaller room in which one body may be placed for the friends of the deceased to see. This latter room may be made to take the form of a mortuary chapel, and should at any rate be finished inside so as to suggest a decent and reverent care for the dead. A marble mosaic floor, glazed tiles on the walls, some simple painted glass in the windows, and possibly a little carving or painting emblematical of the Christian belief in a life to come, will all help to give the chamber of the dead an appearance befitting its use.

The general dead-house should have its walls lined with white glazed tiles or bricks, and its floor should be of cement or tiles, with a channel to carry to the outside the water used for washing. It should be fitted with slate or marble slabs on which to place the bodies, and there should be entrances from this room both into the mortuary chamber and into the post-mortem room.

The post-mortem room should be lighted both with skylights and with vertical windows, unless it has to be arranged as a theatre with seating for students, in which case the one central skylight will have to be made large enough to afford all the necessary light. The walls of the post-mortem room should be of glazed tiles or bricks and the floor of cement or marble mosaic—*mischiati* or *terrazzo*. Under each table, if there are more than one, there should be an open channel formed of white enamelled earthenware, and covered with an iron grating, to take the water from the table and from washing the floor, and the floor should be made with a gentle fall towards these channels. At the head of each channel there should be placed a flushing cistern with pipe leading down to the channel. The channels should be carried to the outside of the building, and there they should deliver into properly ventilated traps.

The fittings of the post-mortem room should comprise (1) the table, which should be made of hard polished marble properly dished out and formed to carry all the water to the centre of one end, where a grating should be fixed, and a copper pipe carried down to the floor channel. The best kind of support is one made of cast iron, sufficiently strong for the purpose but having no excess of strength, and simple in design, with no avoidable ledges or corners in which dust could accumulate. There should also be (2) a sink of glazed porcelain, provided with a funnel pipe to fit into the waste, so that the sink can be filled and the water allowed to run without overflowing the sides; (3) two or more lavatory basins; (4) a marble shelf on which to place organs or parts of the body needed for examination; (5) an instrument case; and (6) a black-board. Hot and cold water should be laid on to both sink and lavatory, and to a hose pipe suspended over the centre of each table. The supply to the latter should have a mixing valve on the wall to regulate the temperature of the water supplied over the table.

In addition to the room described above, the pathological department is sometimes arranged in connection with the post-mortem room. This is the case at the Johns Hopkins Hospital,

Baltimore ; here on the ground floor are, besides the dead-house and waiting-room attached, the autopsy theatre, a room for private research, and two rooms for bacteriological work ; and on the upper floor the director's laboratory, a laboratory for pathological histology, one for experimental pathology, a pathological museum and photograph rooms. The autopsy theatre has accommodation for about eighty students. An interesting detail in this theatre is the arrangement for ventilating the autopsy table downwards by means of a tube opening into the centre of the table, and communicating with the main ventilating shaft.

At the new General Hospital at Hamburg there are, adjoining the post-mortem room, rooms for microscopical work, a chemical room, a physical room, and a bacteriological room.

THE OUT-PATIENT DEPARTMENT.

The out-patient department is a very important part of a hospital, as a glance at the statistics of both general and special hospitals will show. It is therefore somewhat remarkable to find that but little attention is ever bestowed upon it by writers on hospitals. It is important by reason of the enormous numbers of patients who attend there for advice and relief, because it is the channel through which a large proportion of the in-patients enter the hospital wards, and because in it are treated a very large number of cases of special diseases not requiring treatment as in-patients.

The principles which should govern the arrangement of an out-patient department may be considered under two heads: (1) its relation to the hospital proper, and (2) its own internal planning.

1. The relation of the out-patient department to the hospital proper may be stated briefly as "complete isolation." There should be no communication whatever, except by a covered way entirely open at the sides, between the hospital and the out-patient department. The reason for this is obvious. Into the out-patient waiting-rooms some hundreds of people pass with practically no check except such as may be afforded by an observant nurse apt to detect the signs of scarlatina or smallpox in child or adult. In an isolated building the patient may be promptly separated and put into an empty room, without any evil result except possibly to some one or more patients in the waiting-room. But, if the same thing happens in a waiting-room in the centre of the hospital, and in direct atmospheric communication with all

its wards and corridors, the chances of mischief are many times greater and the consequences far more serious. Again, the air of the waiting-rooms is necessarily a more or less contaminated one, and if suffered to escape into the interior of the hospital may become an element of danger to the in-patients.

The one drawback to the complete isolation of the out-patient department is that the dispensary, which is necessarily an integral part of it, must be placed at a greater distance from the wards than when the department in question is under the same roof as the wards. But this inconvenience is insignificant when compared with the advantages gained by complete separation. The in-patients' dispensary should, if possible, be separate (*a*) for economic reasons and (*b*) for purposes of complete isolation of out-patient department.

2. The internal arrangements of the out-patient department should be practically the same in principle in general as in special hospitals, the variations consisting in greater or less elaboration of the component parts as the needs of each hospital may require.

The component parts of an out-patient department are: (1) waiting-rooms and entrances thereto; (2) consulting-rooms; and (3) the dispensary.

The waiting-rooms may either be a single large hall for both sexes, or be subdivided for male and female patients. In large general hospitals there should be a small waiting-room, just within the entrance (or two if the entrance be separate for each sex) for new patients, with the registration office in close proximity. Conveniently near to both waiting-rooms, closets for each sex should be separately arranged.

The consulting-rooms, which will vary in number, according to the size of the hospital, must be placed in immediate communication with the waiting-hall or halls, as the case may be, and the doors should be within sight of all patients and at the bottom and further end of the hall from the entrance. This arrangement will be seen in the plan of the Great Northern Central Hospital, given on p. 88 (fig. 23).

To each consulting-room must be attached a separate smaller room for examination of patients, and a separate room accessible to all the consulting-rooms should be provided for ophthalmoscope work.

There should be doors of communication between all the consulting and retiring rooms, in order that the medical officers may

pass from one room to the other without having to go through either the corridor or the out-patient waiting-hall.

Patients on leaving the consulting-rooms should not re-enter the waiting-hall, but should pass through a separate corridor into a smaller waiting-room next to the dispensary, whence, having obtained their medicines, they will leave by a separate exit door.

The above briefly sets forth the main points in the arrange-



FIG. 21.—WOLVERHAMPTON.

ment of an out-patient department. The variations for special classes of hospitals are not very great. In a general hospital, or one which lame or crippled patients frequent, it is essential that the whole of the accommodation should be on the ground floor. It is desirable that this should be the case in all hospitals, but for some classes of special hospitals, as eye, ear and throat, and diseases of women, it is not of such vital importance. In children's hospitals provision should be made for sheltering perambulators,

and in both children's and eye hospitals the waiting-rooms must be calculated to accommodate in the one case twice, and in the other one-third, more than the actual number of patients in order to allow space for mothers and guides.

In order better to illustrate the planning of an out-patient department, the following three plans are taken as typical instances, and will be described seriatim:—

1. Wolverhampton.
2. Manchester Royal.
3. Great Northern Central, London.

1. *Wolverhampton.*—The out-patient department of this hospital is a one-storey wing, attached to the main building by a covered

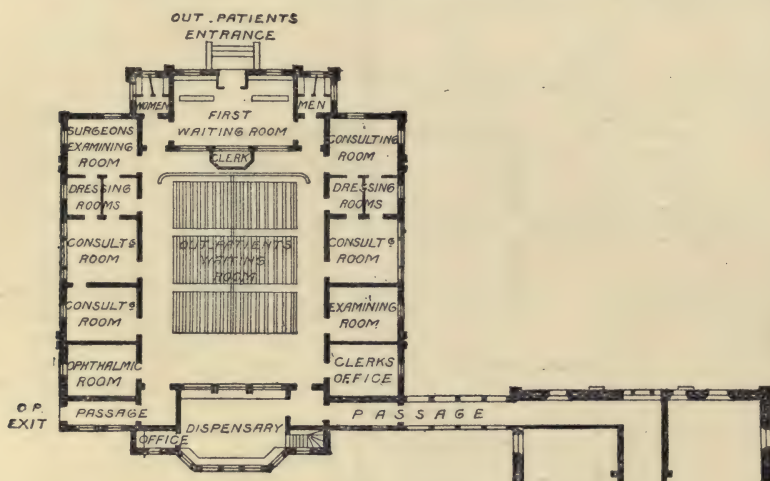


FIG. 22.—MANCHESTER ROYAL INFIRMARY.

porch open at the sides. The patients' entrance is common to both sexes. To right and left of the entrance porch are two waiting-rooms, one for the surgeon's patients, the other for the physician's patients. Communicating with each waiting-room is a consulting-room, with smaller room attached. On the surgical side there is also a casualty-room, with a small room attached.

Between the consulting-rooms is a large waiting space for patients waiting their turn for medicines, and one side of the space is occupied by the dispensary, with its laboratory behind. Patients, therefore, are apparently sorted into medical and surgical cases in the entrance porch, and are drafted to their respective waiting-

rooms. From thence they pass into the consulting-rooms, and thence into the dispensary waiting-room. Having obtained their medicines, they pass out through the entrance porch (fig. 21).

This arrangement has the merit of simplicity, but would hardly be suitable for any but a comparatively small provincial hospital, where only two medical officers are in attendance at the same time.

2. *Manchester Royal Infirmary.*—The out-patient department here is a one-storey building connected with the infirmary by an open covered corridor (fig. 22).

The entrance is in the centre of the front. Immediately within the entrance lobby is a small waiting-hall, with a few seats, those on the left being for men, those on the right for women. In the centre, opposite the entrance, is the clerk's office. After passing the latter, the male patients go to the left, the female patients to the right, through a small lobby into the large waiting-hall. The w.c.'s are arranged off the small lobby just mentioned. The large waiting-hall is divided by a screen down the centre, so that the male and female patients do not mix, neither can the one sex be seen by the other. At the side of each section of the waiting-hall are four consultation-rooms, and between two of the latter are two small examining-rooms communicating with each of the two consulting-rooms. The other two consulting-rooms have no provision of this kind. Patients, after they have been seen by the medical officers, re-enter the waiting-hall and pass to the other end, where they obtain their medicines from the dispensary, and so leave by separate exits, the male to the left, the female to the right, as before.

In respect of complete isolation from the hospital, this building is everything that can be desired. The entrances for patients also are conveniently contrived. The chief defects appear to be an insufficient number of examining-rooms, and the want of direct light and ventilation to two of those provided; and the absence of a separate passage from the consulting-room to the dispensary.

3. *Great Northern Central Hospital, London.*—In this case, as in the two former, the out-patient department is wholly on the ground floor (fig. 23). The two entrances, one for male patients and the other for female patients, with two small waiting-rooms, are placed one on each side of the registration office. After having received their letters the patients enter a large waiting-hall at the further end of which are four doors each giving access to a consulting-room. In the centre of the wall, opposite the entrance, is an indicator and electric bell; the bell is attached to a knob on the table of each con

sulting-room, and when the knob is pressed, a disc in the indicator bearing the number corresponding to the number of the room, is caused to swing. Over each number on the indicator is hung a label showing the name of the medical officer in attendance in each room.

To each consulting-room is attached a small examining-room, and there is also a separate dark-room for ophthalmoscope work. Patients on leaving the consulting-rooms pass by way of a corridor

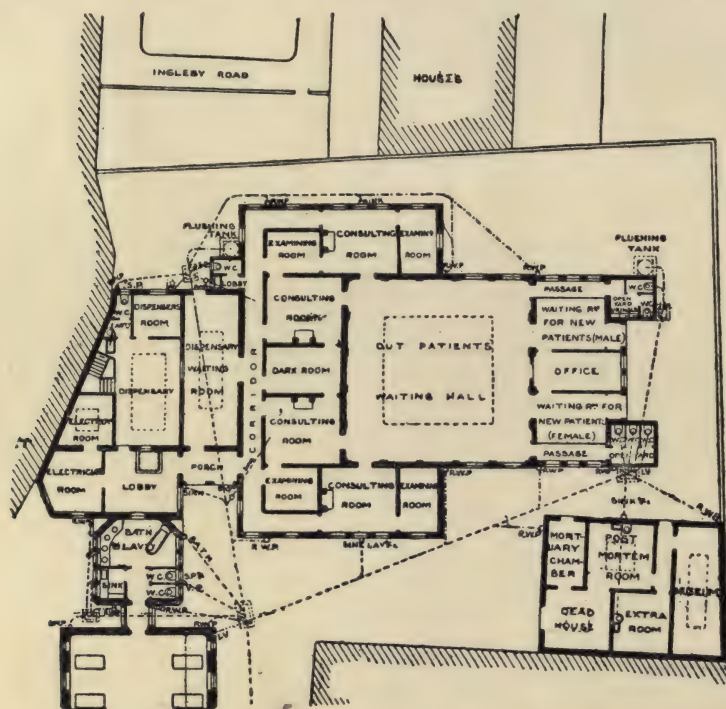


FIG. 23.—GREAT NORTHERN CENTRAL HOSPITAL, LONDON.

to the dispensary waiting-room, where they wait in turn to obtain their medicines.

The closets for out-patients are at the entrance end of the building, and are cut off from the air of the waiting-hall by open yards.

It is to be noted that all the consulting-rooms communicate freely one with another, so that the medical officers have access to each other without going into the corridor or waiting-hall; and also that patients do not cross each other, neither do they retrace their steps in any way.

The out-patient department at the Johns Hopkins Hospital, Baltimore (fig. 24), is a separate one-storey wing joined by a corridor



to the operation-theatre wing. It is modelled on the lines of the one at Manchester, and has a central waiting-hall, with a common entrance and five rooms for medical officers on each side. At the end opposite to the entrance are two bath-rooms and two W.C.'s for each sex. On one side of the corridor, connecting this building with the operation-theatre wing, is a 'janitor's' room and a small waiting-room adjoining the accident reception-room.

Of other out-patient departments, that at the Queen's Hospital, Birmingham, most nearly resembles those above described. It is practically very much on the lines of the Manchester Royal Infirmary, but has at each side over the consulting-rooms a set of resident officers' rooms. When first built, these rooms were in free communication atmospherically with the hall below, a defect which was most prejudicial to the comfort of their occupants. This has since been partially remedied, but the plan in this respect cannot be considered as a model for adoption.

The out-patient departments at the large general hospitals of London are, with the exception of those at St. Bartholomew's, St. Mary's, and St. Thomas's, within the main buildings. At the London the department is in the basement, at Guy's in the lower floor of the "new building" (Hunt's House). The out-patient department at the Middlesex, reorganised some few years ago, is under one of the main ward-wings. At Charing Cross and St. George's it is in the basement, at King's College partially so, and at University College it is on the ground floor of the main building.

At St. Bartholomew's the out-patient department is divided into two parts, detached from each other by the extreme length of the site. One part, which faces Smithfield, contains a large general waiting-hall with four consulting-rooms, two surgeries, and a dispensary. The other part contains two waiting-rooms, one for physician's patients, the other for surgeon's patients, with a consulting-room attached to each, and two other waiting-rooms, one for men, the other for women, adjoining the "apothecaries' shop," or dispensary.

The out-patient department at St. Thomas's Hospital is placed on the Palace Road side of the buildings, and consists of a large general waiting-room, a series of consulting-rooms, and a separate dispensary waiting-room for medicine, &c. Separate baths for out-patients are also provided.

The out-patient department at St. Mary's Hospital is of recent date, and is two stories in height (fig. 25). The entrance is on the

ground floor, into a small lobby, whence patients, after passing the registrar's office, enter a waiting-room. On this floor are two con-

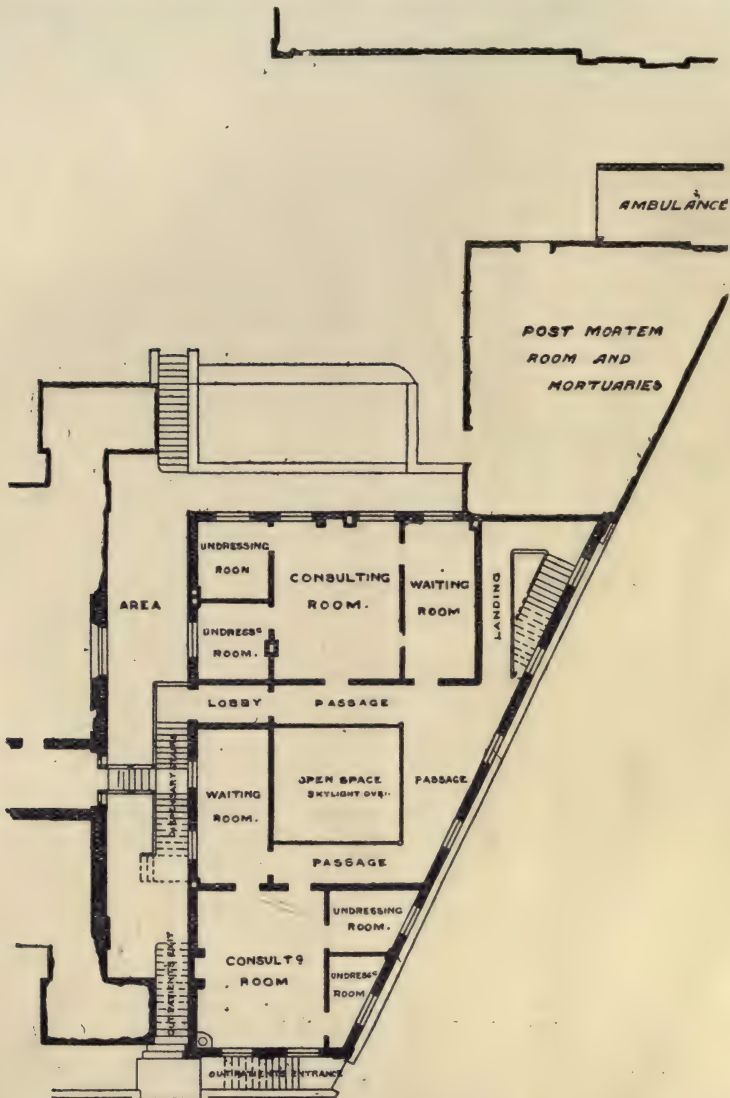


FIG. 25.—ST. MARY'S HOSPITAL, PADDINGTON.

sulting-rooms, one, the oculist's room, having a dark-room attached. On the floor above are two second smaller waiting-rooms and two consulting-rooms, each with two examining-rooms attached. After

leaving the consulting-rooms, patients have to descend to the dispensary, which is in the basement of the main building, and thence again ascend to the street level. They therefore, if seen in one of the upper consulting-rooms, have first to ascend one storey, then descend two, and finally ascend one storey. The arrangement can only be accounted for by the very cramped nature of the site, and is in every way most objectionable.

The out-patient department at the German Hospital, Dalston,



FIG. 26.—LEEDS GENERAL INFIRMARY.

is an entirely detached building placed at some distance from the hospital. It consists of a large general waiting-room with a single entrance. On one side of the waiting-room are four consulting-rooms, and between these and the space occupied by the patients' seats is a passage, parted off by a barrier, in which are three gates. There is a separate entrance, with cloak-room and water-closet, for

the staff. No examining-rooms appear to be provided. The patients, on leaving the consulting-rooms, return into the passage, and at the further end of the room pass into a corridor which leads them into a lobby adjoining the dispensary. In the wall of the latter are two serving windows. The exit door is from the dispensary lobby. Attached to the dispensary is a laboratory. There are water-closets for patients, one for each sex, placed side by side. On the same site as the out-patient department is the mortuary building and a porter's lodge.

At the New Royal Infirmary, Liverpool, the out-patient department occupies the ground floor of one of the ward-wings. The building is long and narrow in form and has a semicircular apse at one end. The other end joins the main corridor. The patients' entrance is at the end furthest from the corridor, and the apse is devoted to waiting-space for "unsorted" patients. About two-thirds of the length of the remainder is divided longitudinally into two parts. One part is the waiting-room for "sorted" patients. The other part is divided into five doctors' rooms, with two intervening lobbies and a small dressing-closet to each room. The rest of the wing, which is wider than the part described, contains a small waiting-room and a sixth doctor's room, with dressing-closet, medicine waiting-room, dispensary, and drug-store. The exit is from the dispensary waiting-room along a corridor at the side of the main waiting-room, and thus into the main hospital corridor.

The out-patient department at the Leeds General Infirmary is a recent addition to the hospital (fig. 26). It is a one-storey building and consists of a large waiting-hall, round three sides of which the consulting-rooms and other offices are grouped. There is one entrance common to both sexes of patients and one exit, and there does not appear to be any provision for registering or giving out letters to patients before entering the main waiting-hall. The whole of the consulting and other rooms communicate from end to end, but patients must all re-enter the waiting-hall in order to reach the dispensary. The excessive use of bay windows does not seem calculated to serve any practical purpose, and especially in the small operation room would seem rather to impede than add to the lighting. The water-closets for patients are ill-arranged, and there does not appear to be any provision for a refreshment bar.

At the Sussex County Hospital, Brighton, there are separate

entrances and separate waiting-rooms for men and women, and also separate waiting-lobbies to the dispensary, but the exit appears to be in both cases by the same door as the entrance. Bath-rooms, one for each sex, are also here provided for out-patients.

The out-patient department at the General Hospital, Nottingham, consists of a large waiting-room of irregular shape, with two consulting-rooms, to each of which is attached a retiring-room. A peculiar feature is that the consulting-rooms have each two doors, one for entrance, the other for exit, placed close to each other. There are also two doors to the waiting-room, the exit door being out of a large lobby in which is the dispensary serving window. The department is in direct communication with the hospital corridor.

At Lincoln County Hospital the out-patient department occupies the ground floor of one ward pavilion. The entrance is at the end furthest removed from the corridor, and the water-closets are placed in the projecting angle-turrets under those of the wards above. There is a large general waiting-room, at the end of which a central corridor gives access to two consulting-rooms, each with its retiring-rooms; beyond these is the dispensary waiting-room and dispensary with exit.

NURSING HOMES.

The arrangements necessary for a nursing home do not vary very much, whether the home be for a large or a small number of nurses. The only important difference depends upon the question whether the nurses are to have their meals in the home or not. If so, then the home must include suitable kitchen offices and a dining-room; if not, then no kitchen offices will be required, and the dining-room will be in the hospital, not in the home.

In some instances the home for nurses will be found, as at the Middlesex Hospital for example, to consist of two separate establishments, the one being confined exclusively to nurses on active duty in the hospital, the other to nurses who are sent to cases outside the hospital. In other institutions, such as at the Westminster Hospital, one home suffices for both classes of nurses. At the Middlesex Hospital, where the institute for supplying trained nurses to the public immediately adjoins the home for nurses, which communicates directly with the hospital, there is a reason for keeping the two distinct; for there would be an obvious disadvantage in allowing the nurses belonging to the institute free access to the

hospital when they are off duty. And inasmuch as the institute nurses are liable to and should be ready to be sent off to a case at a moment's notice, the possibility of their being temporarily employed in the hospital while off duty is materially lessened by the separation of the two buildings. At the Westminster Hospital, on the other hand, the home for nurses is at some little distance from the hospital, and the same reasons for separating the two classes of nurses does not therefore exist.

The question whether the nurses should or should not have their meals in the home is an economic one, and turns upon whether or not the hospital kitchen can be made to serve for both patients and staff. In building an entirely new hospital, there can be no question that, whatever its size may be, a central kitchen for all purposes would be the most economical arrangement, and the reason that so many large London hospitals have provided separate kitchens for their nursing homes is probably to be found in the fact that not only have the hospital kitchens proved unequal to the work, but that no place could be found sufficiently close to the kitchen for the dining-room. In the case of a nursing home altogether detached, and at a distance from the hospital, the provision of kitchen offices seems a necessity.

Whether the nurses take their meals in the home or in the hospital, their sitting-rooms should always be in the home. In large hospitals, and where lady probationers are taken, it is customary to provide separate sitting-rooms for the nurses and the lady probationers, but in almost all the large London hospitals the head nurses or ward sisters have each their own sitting-room next their ward.

Provision should usually be made for a sitting-room and bedroom for a housekeeper or assistant matron.

At least one room capable of holding two beds should be allotted as a ward for sick nurses, and should have adjoining it a pantry, water-closet, and sink. In homes which contain no kitchen offices the pantry should be fitted with a small range of sufficient size to perform any cooking wanted for the patients. An extra bedroom or two for nurses should also be provided near the sick ward.

The bedrooms should be separate rooms divided by partitions reaching to the ceiling, and should not contain more than one bed each, with a fireplace in every case.

Bath-rooms, in sufficient number to enable the nurses to have frequent baths without inconvenience, should be provided. The

proportion should not be less than one bath-room to every ten nurses, and ought, if possible, to be more. In planning the rooms, regard should be had to the fact that a certain proportion of the nurses will always be on night duty, and their rooms should be grouped together as far distant as convenient from the staircase, and should have separate bath-rooms and water-closets.

Water-closets and housemaids' closets are required on every floor, and should, if possible, be built out in towers with cross-ventilated lobbies of communication.

Box-rooms are also required, and if space will permit there should be one on every floor. They should be fitted with strong open shelves for boxes, arranged in such a way that every box can be reached by its owner without having to move any other box.

In details of construction there is not very much that is special to this kind of building. Everything should be plain but of substantial and lasting quality. Staircases and corridor floors should be fire-proof. The rooms should all be provided with a plain varnished picture-rail to enable the occupants to hang pictures without driving nails into the walls. All the locks should be made *en suite*, with a master-key to pass the whole—the lock of each room being different to all the others. A detail of this kind, insignificant as it may seem, adds much to the ease and comfort with which a large building is administered.

Westminster Nurses' Home.—This institution is at some little distance from the hospital, and is built on a somewhat confined site in Queen Anne's Gate. The main building consists of basement and four floors over. The basement contains the kitchen offices, stores, &c. On the ground floor is the matron's sitting-room, a day-room, and a refectory for nurses, lavatory, and waiting-room. At the end of the refectory are two water-closets lighted and ventilated (?) solely by skylights.

The upper floors are occupied by bedrooms, with a bath-room and water-closet on each floor. A lift ascends from the basement to the top floor, and a dinner lift from the basement to the ground floor.

At the back of the site, separated from the front building by a narrow courtyard, is a two-storey building containing on the basement a disinfecting room, bath-room (lighted by borrowed light), a water-closet, and a separation-room, and on the ground floor two separation-rooms. These rooms receive their sole light and air from the narrow courtyard referred to, and cannot be regarded as

at all satisfactory. The whole building appears much too crowded and inadequately provided with light and ventilation.

The London Hospital Nursing Home.—This home is one of the later additions to the hospital. It consists of two separate buildings joined together by the staircase and connecting corridor. The lowest floor, which is slightly below the level of the garden, is partly occupied in one building by the matron's house, the upper floor of which forms a mezzanine floor between the basement and the ground floor. In the other building the steward's house is similarly placed, the two floors being below the ground floor of the home. The remainder of the basement contains the kitchen offices and servants' quarters.

On the ground floor the smaller building contains two dining-rooms divided by sliding doors, the larger one being for the nurses, the smaller one for sisters.

The larger building contains on the upper floors the nurses' bedrooms with, on each floor, two bath-rooms, water-closets, and housemaid's closet built out in a projecting wing with a cross-ventilated lobby of access. At each end of the main corridor, and also at the end of the corridor to the baths and water-closets, are French windows opening out upon balconies, for escape in case of fire.

The Ingleby Home for Nurses, General Hospital, Birmingham.—This is an example of a home in which no kitchen offices or dining-rooms are provided. In the centre of the building is a large hall, which extends the whole height, and around which on the upper floors are galleries giving access to the rooms.

On the ground floor are two day-rooms of unequal size, a lavatory, and a store-room. The rest of this floor is occupied by bedrooms. On each of the two upper floors are bedrooms with a bath-room and a water-closet.





CHAPTER V.

GENERAL PLANNING.

Considerations in determining plan of Hospital.—Influence of area, conformation, and shape of Site.—Influence of Climate.—Classification of Hospitals according to arrangement of their Wards.—Pavilion Hospitals.—Block Hospitals.—Corridor Hospitals.—Composite or Heap-of-Buildings Hospitals.

THE determination of the special form of plan to be given to a hospital depends on several considerations. The area, conformation, and shape of the site must necessarily influence in a very marked degree the disposition and form of the buildings to be placed upon it. Of the adaptation of the disposition of the buildings on the ground in relation to the shape of the site, Swansea Infirmary is a very apt example. This is an instance of an almost triangular site with the central block occupying the apex and the ward blocks slanting off parallel to the sides, an arrangement obviously suggested by the shape of the site. As an example of the conformation of the ground influencing the arrangement of the buildings, Edinburgh Royal Infirmary may be cited, where the fall of the ground is so rapid that what is ground floor at one end of the site becomes first floor at the other end. Area of site will of course determine not only the disposition of the buildings in relation to one another, but also their height. In many of the foreign hospitals, especially some in Germany, which have recently been erected, the area of site is so great in proportion to the number of beds, that although the ward pavilions are of one storey only in height, there is the most ample space around and about them.

Climate, again, is an important factor in the consideration of hospital planning, the requirements in England and those in India, for example, being of a very different nature.

In all hospitals, however, whether they are in the tropics or in Europe, on an ample site in the country, or on some much restricted site in a town, the ward is the most important feature, and the one in relation to which all the other parts must be grouped; and in adopting a system of classification for the more intelligible ordering of the subject, it will be found that the most marked and essential difference between one group of hospitals and another lies in the position of the wards in relation to each other and to the other parts of the building.

The following system of classification has therefore been adopted as being a simple, and, on the whole, a satisfactory scheme, but it is not, of course, put forward as being a perfect one. Cases must and will occur of hospitals which fall as readily into one group as into another; and there are other cases where the plan can scarcely be said to belong to any group. Such exceptions as these are, however, inevitable to any scheme of classification, and do not necessarily vitiate the general order.

Class I.—PAVILION HOSPITALS.

In this class are included all hospitals which have their wards constructed on what is known as the pavilion system—that is, in which the ward is a parallelogram entirely detached on at least three sides, with windows on both of its longer sides facing each other, and attached to the main block at one end only. This class is again subdivided into six sub-classes as follows:—

Sub-class IA.—*The single pavilion* or straight plan, *i.e.* two pavilions placed end to end with the administration interposed.

Sub-class IB.—*The double pavilion*: two pavilions joined together by a corridor in the centre of which the administration is placed.

Sub-class IC.—*The multiple pavilion*: a number of pavilions arranged either on one or both sides of a corridor.

Sub-class ID.—*Circular wards*.

Sub-class IE.—A combination of both *circular and rectangular wards*.

Sub-class IF.—*Isolated pavilions*, *e.g.* with no connecting corridors.

The essence of the pavilion system is the isolation of the wards from the rest of the hospital, and the perfection of the system is attained when not only each pavilion is cut off from the administration and the other pavilions, but when each floor is separated from the floors above or below. The extreme limit of isolation is

reached when, as in some modern foreign hospitals, the connecting corridors are abolished altogether and the pavilions are confined to one storey.

Class 2.—BLOCK HOSPITALS.

This class includes hospitals whose wards are arranged in different blocks, either isolated from each other or connected together, but in all cases having the wards exposed to the air on at least two sides so as to ensure cross-ventilation. In this group will be found some few hospitals more properly belonging to the class of pavilion hospitals, but placed here for convenience of reference to general form of plan.

This class is subdivided as follows :—

Sub-class 2A.—Four blocks arranged in a square, but detached from one another with a free space at each angle.

Sub-class 2B.—Two blocks in the form of an L.

Sub-class 2C.—Three blocks arranged as a rectangular U.

Sub-class 2D.—Three blocks arranged as an H.

Sub-class 2E.—Four blocks arranged round a quadrangle and connected together at the angles.

Sub-class 2F.—A single straight block.

Class 3.—CORRIDOR HOSPITALS.

The wards in this group are arranged along one or both sides of a corridor, and are therefore for the most part ventilated on one side only. The class is divided into two :—

Sub-class 3A.—*Single corridors*, which have wards on one side only of the corridor, the other side being open to the air.

Sub-class 3B.—*Double corridors*, where the wards are placed on each side of the corridor.

Class 4.—COMPOSITE OR HEAP-OF-BUILDINGS HOSPITALS.

The fourth group comprises all those irregular or composite plans which cannot be properly grouped in any of the foregoing classes. The plans in this class will be found, in many instances, to be those of old buildings to which from time to time additions have been made often without regard to any consideration but the need of the moment.



CHAPTER VI.

CLASS I.—PAVILION HOSPITALS.

Consisting of six sub-classes:—1A, The Single Pavilion; 1B, The Double Pavilion; 1C, The Multiple Pavilion; 1D, Circular Wards; 1E, A Combination of both Circular and Rectangular Wards; and 1F, Isolated Pavilions.

Sub-class 1A.—THE SINGLE PAVILION.

Type: West Bromwich Hospital. See p. 107.



ADDENBROOKE'S HOSPITAL, CAMBRIDGE.

As originally designed this hospital was a typical form of the class. The administration occupied the centre and on either side were placed the wards.

This arrangement has been modified by the addition of a wing projecting eastward from the southern pavilion. The hospital stands well back from the public road, and a striking feature in the front elevation is the way in which the building on each side of the centre is recessed to form two large balconies. The ground floor of the southern wing is occupied by the out-patient department. The wards are well proportioned and very cheerful, the treatment of the smoke-flues from the central fireplaces enhancing greatly the appearance of the wards. These flues, instead of being carried up, as is so commonly the case, in huge masses of brickwork, are formed of terra-cotta pipes with foliated caps and moulded bases, and are to all appearance columns. The beds are coupled and the water-closet arrangements are not entirely satisfactory, the disconnection being imperfect. In most cases the sister's room, which is a combined bed- and sitting-room, is entered only from the ward. Such an arrangement is always objectionable, but in this instance, where a detached Nurses' Home exists, it is difficult to see the justification for its continuance. The wing which projects from the south ward contains on the ground floor

part of the out-patient department and special wards, and on the first floor small wards, the wards at the extreme end being intended for isolation purposes and having a separate staircase. The first floor is detached from the ward block about twenty feet, by which means the cross-ventilation to the upper wards is not wholly impeded. The washhouse adjoins the last-named block, but is entered only from the outside. The mortuary is a wholly detached building. A detached Nurses' Home, giving accommodation for about twenty-four nurses, is placed in an angle of the site adjoining the back road.

Burton-on-Trent Hospital.—The site upon which this hospital stands is a somewhat restricted one, and the proportion of ground occupied by buildings to that unbuilt upon is large. The main building, which is two storeys high, is planned in the form of a T, the upright stroke being occupied by the out-patient department and the resident officers' quarters, whilst the horizontal part contains the wards. The kitchen offices and laundry are placed in a one-storey building at the back of the right-hand wing, separated from it by an airing-court about twenty-four feet wide for female patients. The mortuary and post-mortem room are in a detached building at one corner of the site. The wards are on two storeys, and the staircase is common to all wards and to the administrative department. There is also a lift for patients from the ground floor to the first floor. The whole building, with the exception of the laundry and mortuary, is in complete atmospheric communication.

Cork.—See South Infirmary, Cork.

Cumberland Infirmary, Carlisle.—The plan of this hospital differs from the foregoing in having its ward pavilion placed at right angles to the administration block, from which it is separated by a corridor about fifty-five feet in length. The ward pavilion is a double one. In the centre is the staircase, on each side of which a short length of corridor with windows on each side leads to the ward. At the entrance to each ward is a nurse's room, a scullery, a bath-room, a lavatory, and two water-closets. The latter are entered from the ward by an independent passage, but are cut off by a cross-ventilated lobby. This arrangement leaves the ends of the wards free from any projections. The cross-ventilation to the wards is varied in a somewhat unaccountable way. In the centre are four windows equidistant from each other, and with a bed to each pier. There is a long space of blank wall with two beds, then a single window, and a bed in the corner, this arrangement being repeated on each side. The coupling of eight beds out of the eighteen does

not commend itself as a desirable arrangement on any grounds, and could apparently have readily been avoided.

The administration block, which was the original hospital, now is devoted almost entirely to residences for the staff and to the domestic offices, the only exception being the operation room and a small ward adjoining. A noteworthy feature in this block is the careful disconnection of the water-closets. This point is very seldom attended to, even where the water-closets attached to the wards are properly arranged, but it is as important in one case as in the other. The mortuary is a detached building at the back of the main block. On the side of the main block opposite to the ward pavilion is a wing connected to the main block by a corridor, and devoted to the out-patient department.

Donegal County Infirmary.—The only information obtainable, beyond that set forth in the table at page 108, is that a new hospital which presents "no novelty in the plan, but in which all recent improvements in details have been adopted," has recently been erected.

East Suffolk Hospital, Ipswich.—The plan of this hospital, like that of Burton-on-Trent, differs from the type in having no corridor separating the central block from the wards. It consists of a central block facing south, with ward wings projecting to the east and west, and to the north a separate detached block with a corridor connecting it to the central block. In 1877 a wing was added projecting southwards at right angles to the extreme end of the western ward. The central block contains the administrative offices and resident officers' quarters. The detached block to the north is devoted to the out-patient department, and other entirely detached buildings contain the mortuary and washhouse. In the wards the beds are coupled, and the disconnection between the wards and the water-closets is very imperfect.

German Hospital, Dalston.—The plan of this hospital differs from the type in having the administration department in a separate building connected with the ward block by a corridor. The ward block is one straight building with a slight projection in the centre, which contains the ward sculleries, sisters' and nurses' rooms, staircase, bath-room, and lift. This block runs nearly due east and west, and on either side of the central part are the wards. There are on the first floor two wards on each side; those on the west side opening into each other, those on the east side not communicating, but a corridor being taken out of the width of the first ward

to give access to the second. The first ward, therefore, has no cross-ventilation. The disconnection between the wards and the water-closets is imperfect. The administration block forms three sides of a quadrangle, and contains, besides the usual officers' quarters, the operation room and isolation wards. The washhouse and mortuary are placed in a detached building at the angle of the site furthest removed from the wards. The out-patient department is an entirely detached building separated from the grounds of the hospital proper by the North London Railway.

Gloucester General Infirmary.—In plan this hospital resembles the Cumberland Infirmary (p. 102). The administration block occupies the centre, while to the right is a single pavilion with the same axis as the central block (corresponding to the out-patient wing at Carlisle), and to the left is a double ward pavilion at right angles to the central block and connected thereto by a corridor. The central portion was erected about the year 1761, and is of the old-fashioned corridor type. The south wing (single pavilion) was added in 1826, the north wing in 1869, and the projecting buildings containing the water-closets were added in 1878-9. In a detached building, but connected by a corridor with the main building, are the laundry and mortuary.

Hull General Infirmary.—This hospital underwent in the year 1884-85 very extensive alterations, and it will be well to describe first the condition of the buildings before the alterations were commenced. The buildings stand upon a triangular plot of ground bounded on each side by streets, and the hospital grounds formerly occupied little more than half of the triangle. On the west side, the whole of the frontage to Brook Street was occupied by houses, and this was the case to a great extent in Mill Street on the south, and to a less extent towards Prospect Street on the north-east. The buildings consisted of a large main building facing north-east, with wings projecting to the south-west in which were wards of all shapes and sizes, built originally in 1784 and added to subsequently at several different periods. In addition to this there was a detached building containing infectious wards, and another containing the washhouse and mortuary. The alterations made in 1884 consist—first, in the erection of two wings at each end of the central block, containing sick wards on three floors; secondly, in the removal of all sick wards from the central block, which is now devoted entirely to administrative purposes, and the severance of the block from the ward, communication between the central

block and the wards being provided by way of light iron bridges ; thirdly, in the entire demolition of the old washhouse and mortuary building, and the erection of a new building for these purposes at the extreme south angle of the site ; fourthly, in the conversion of the infectious wards into a nursing home ; and lastly, in the erection of a new detached out-patient department. In carrying out these alterations, all the adjoining property except two small portions, one at the south apex and the other at the south-east apex of the triangle, were acquired by the hospital, and by this means the buildings stand on a site almost entirely isolated. The new are very much better than the old wards, but it is much to be regretted that the objectionable system of coupled beds should have been adopted, and that effectual disconnection between the wards and the water-closets should have been sacrificed apparently to external architectural effect.

Royal Hants County Hospital, Winchester.—The present building was erected in 1868 to replace an old building founded in 1736, which, according to the plan in Bristowe and Holmes' report, was very much on the same lines as the new one. The former hospital was in a low-lying part of the city, the present one is on West Hill. The plan is a very typical form of the single pavilion, having a central administration block with a ward wing each side. The main entrance is in the centre, and faces north, the longer axis of the building being east and west. The basement floor, owing to the fall of the ground, is almost entirely above ground at the back. It contains in the centre and part of the east wing the kitchen offices, matron's dining-room, and board-room. The extreme end of the east wing contains seven servants' bedrooms. The west wing contains the out-patients' department. The women's waiting-room has a water-closet opening directly out of it. The men's waiting-room is merely a passage with a seat on each side, and from the arrangement of the consulting rooms and dispensary, each patient must retrace his steps through the waiting-room in order to get out. Out-patients also have to enter at the main entrance or else down a staircase into the kitchen corridor—either way being a very bad arrangement. The dead-house and post-mortem room are partly under one of the water-closet towers at the south-west angle of the west wing, and communicate by a corridor with the interior of the hospital. The central part on the ground floor is occupied by the main staircase, a subsidiary staircase to the basement only, house surgeon's sitting-room, secretary's office, a long

narrow slip—six feet wide and twenty feet long—two ward sculleries, two nurses' sitting- and bedrooms (combined), a store for patients' clothes, and a men's ward for four beds. The wards each contain eighteen beds, which are arranged in pairs between the windows. The water-closets and bath-rooms are placed in towers at the ends of the wards, and are provided with cross-ventilated lobbies. Between the two towers a balcony is arranged at the end of each ward. In a mezzanine floor over the secretary's office and the clothes' store are two small bedrooms, one for the house surgeon, the other for a pupil. Two separate staircases are provided for access to these rooms, which, as the height of the storey is fifteen feet, cannot be more than seven feet high. On the first floor the same ward sculleries and nurses' rooms occur, a women's ward for four beds, matron's sitting-room and bedroom, and a linen store with water-closet opening directly out of it over the two bedrooms just described. The wards are similar to those below. There is a third storey of wards above, and part of the central block is taken up yet another storey higher. There is a cottage in the grounds for the isolation of infectious cases arising in the hospital.

South Infirmary, Cork.—Beyond the fact that the plan of the hospital resembles that of the type, no further information has been forthcoming.

Suffolk General Hospital, Bury St. Edmunds.—The plan of this hospital differs materially from many in this class. In this case the central block is recessed and the ward pavilions are brought forward. At the back of the central block is a courtyard flanked on three sides by buildings. On the south is the central block above mentioned, on the east a three-storey block containing bath-rooms and stores in basement, the out-patient department on the ground floor, and an ophthalmic ward and two bedrooms for residents on the floor above. On the west is a four-storey block containing the kitchen offices in the basement, chapel and committee room on ground floor, ophthalmic ward and matron's bedroom on first floor, and bedrooms for staff on second floor. The staircases for access to the upper wards are placed one at each end of the central block, and are continued down to the basement, which is occupied by store-rooms and other offices. The wards, four in number, are placed in two storeys in the two ward pavilions, which project east and west on either side of the central block. The beds are coupled; the water-closets and bath-room are at one end of the ward, but there is no disconnection beyond what is afforded by a double lobby without means of cross-ventilation. The post-mortem

room and dead house occupy one extreme corner of the site, and the washhouse is in the opposite corner.

Surrey County Hospital, Guildford.—This hospital is one of the very few from which it has not been possible to obtain plans. The plan, however, as published in Dr. Oppert's work on hospitals, may be taken as fairly correct. It appears to be a single straight block with the administration in the centre, and the ward pavilions at either side. The kitchen offices are in a projecting wing at the back, and the out-patient department occupies the ground storey of the east wing.

West Bromwich Hospital.—In this hospital the distinctive form of plan of the sub-class is well shown. The central block, which contains the administrative offices, projects considerably in front of the general line of the wings in which the wards are placed. The corridor connecting the two ward pavilions crosses the administration block and divides it into two parts, the front part containing the out-patient department and the resident officers' quarters, whilst in the back part are the kitchen offices. A short length of one-storey corridor separates in each case the ward pavilions from the central block. The ward pavilions are two storeys in height, and contain each a ward for eleven beds, a large room adjoining used either for convalescents or as a separation ward, small ward, scullery, nurses' room, and a bath-room, a water-closet, and a sink room placed in a projecting tower at the angle of the ward and separated therefrom by a cross-ventilated lobby. Each ward has two fireplaces, one at each end. The nurses' rooms are entered only through the ward, which is a most objectionable arrangement, particularly if, as is often the case, these rooms are used as bed- and sitting-rooms combined.

West Herts Infirmary, Hemel Hempstead.—The plan of this hospital closely resembles that of West Bromwich. The central block is crossed by the corridor, which connects the two ward pavilions and which almost exactly bisects it. The front portion of the central block is occupied by the resident officers, whilst the back part (ground floor) contains two wards with adjoining offices. The ward pavilions are connected to the central block by wide corridors, in each of which is a large bay window intended to serve as day room for convalescent patients. In each case the ward block consists of a general ward for ten beds, a smaller ward for six beds, a special ward for two beds, nurses' room, ward scullery, and bath-room. The water-closets occupy a projecting building at one angle of the ward. The out-patient department and the kitchen offices occupy the basement floor of the central block.

British Hospitals.—Class I, Sub-class 1A.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
West Bromwich	50	6'00	90'90	15'00	1,353'50	30'91	1,192'50
German Hospital, Dalton	112	—	100'62	15'20	1,55'39	20'20	625'97
Addenbrooke's, Cambridge	150	5'50	114'00	16'00	1,824'00	27'55	799'20
Cumberland	100	8'00	100'00	14'00	1,400'00	37'05	2,776'95
Gloucester	156	8'00	84'00	15'00	1,260'00	20'62	907'50
West Herts	44	7'00	88'36	14'00	1,237'04	25'58	3,217'50
Burton-on-Trent	60	6'50	98'75	14'00	1,382'50	—	338'25
Suffolk General, Bury St. Edmunds..	80	* 10'00 6'00	103'56	16'00	1,656'96	23'75	713'57
East Suffolk Ipswich	110	* 9'50 6'50	101'06	14'25	1,435'50	22'75	1,111'27
Hull	275	† 7'12 7'50	† 95'00 100'00	† 13'50	† 1,331'00 1,346'00	† 19'46 19'70	† 518'00
Surrey County, Guildford	97	9'00	109'52	16'00	1,971'36	24'47	1,796'28
Royal Hants County, Winchester ..	104	* 6'25 9'00	106'66	15'00	1,599'90	31'94	—
Cork, South Infirmary	—	—	—	—	—	—	—
Donegal, County Infirmary	50	6'00	60'00	15'00	900'00	12'50	871'20

* Coupled beds. † Figures quoted from Mouat and Snell, upper figures relate to N.W. wing, lower to S.E. wing, window area is glass only.

Published plans:—Addenbrooke's—Bristowe and Holmes; Oppert; Cumberland Bristowe and Holmes; Bury St. Edmunds—Bristowe and Holmes; Hull—Mouat and Snell.

Foreign Hospitals.

The Michael Reese (Jewish) Hospital, Chicago.—As will be seen from the plan, the arrangement of the building takes a somewhat peculiar form. The main building consists of a central block and two wings, the latter being set at an acute angle to the front corners of the former. A second block of exactly similar plan is projected in the future, and will be so placed that the space in front will form a courtyard of six sides of a decagon. The precise reason for this arrangement is not obvious, and it clearly has some disadvantages. The building consists of three floors, a basement and two upper floors. In the basement the central part contains the kitchen offices and a large dining-room, one wing contains the out-patient department and drug store, three "strong wards," linen store and store-rooms, and the other wing is devoted to the boilers, &c. On each of the two upper floors are two wards, one in each wing; at the entrance end of each ward is a nurse's room and a private ward, and between the two latter rooms are two water-closets, one entering into each room. These offices are without any direct light, and apparently depend for their ventilation upon the action of the main extraction-shaft against which they are placed. The water-closets and bath-room for the large wards are placed in projecting wings at the farther end. There is a lobby between the

ward and the water-closets, but it is not provided with cross-ventilation. The central block is occupied by resident officers' rooms and private wards. The heating system adopted here is what is usually known as "indirect radiation." Near the ceiling of the basement storey, large coils of steam pipes are placed, enclosed in iron cases; fresh air is admitted by means of flues ascending from near the ground, level to the under side of the coil boxes; and from the upper side of the coils other flues ascend to the wards, conveying thereto the fresh warmed air. The vitiated air is extracted by means of openings in the floors, which communicate with flues passing under the floors to a main extraction-shaft. In the case of the wards placed over the boiler-house, the smoke-flue passes up through the centre of the extraction-shaft, and by this means an upward current is induced. In the other wing the extraction-shaft has in it a coil of steam pipes.

Foreign Hospitals.—Class I, Sub-class 1A.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
FRANCE. Hertford Hospital, Paris ..	24	ft. —	ft. 107'50	ft. —	ft. 2,393'90	ft. —	ft. 3,269'79
GERMAN EMPIRE. Magdeburg*	78	—	—	—	—	—	—
UNITED STATES. Chicago, Michael Reese Hospi- tal (for Jews)	—	—	—	—	—	—	—
Plainfield, N.J. Muhlenberg Hospital	—	—	—	—	—	—	—

* Published plans :—Magdeburg : "Grundriss-Vorbilder," L. Klasen.

Sub-class 1B.—THE DOUBLE PAVILION.

Type : Swansea Hospital. See p. 114.

Ayr County Hospital, N.B.—The site upon which this hospital stands is an irregular shaped piece of land on the banks of the river Ayr. The buildings comprise the general hospital, the fever wards, the lodge, and the washing-house. The general hospital presents very much the form of the **E** so frequently referred to, with the addition of an annexe at one corner in which the kitchen offices are placed. The wards are attached to the central block with no intervening corridor, and the whole building is in very

free atmospheric communication, one part with another. The out-patient department, which appears to be small, is placed in the central block, in the centre of which is also the operation room. The fever hospital consists of two pavilions, each containing two general wards and a private ward, with a nurse's room communicating with both the general wards, a small kitchen and a scullery. The two pavilions are placed end to end, and joined by a narrow building containing two sets of bath-room, water-closet, and sink, one set for each ward.

Birkenhead Hospital.—This hospital is a small and simple example of the type. It consists of a central block which is bisected by the corridor, and two ward pavilions placed at right angles to the central block. The short piece of corridor which connects the main block with the wards is ventilated on one side only, on the other side being the ward scullery. To each ward is attached a nurse's room and a pantry, with no visible means of ventilation. The water-closet and lavatory arrangements at the end of the wards are particularly bad. A curved passage leads from the ward to the lavatory and thence to the water-closet and bath-room, all being in closest atmospheric communication with each other and with the ward.

Bolton Infirmary.—This is another example of the same form of plan as Macclesfield (p. 111), but a long curved corridor, extending from the back part of the administration block, connects the latter to a third pavilion containing two children's wards. The front part of the administration block is a long straggling and extravagantly planned building. Economy of planning, indeed, does not seem to have entered into the architect's calculations at all, as, judging from the accounts published by the committee, the extras amounted to over 33 per cent. of the original contract amount. The ground floor of the eastern block is occupied by the out-patient department, and some small wards, two of which are called 'casual wards,' and are destined presumably for accidents. The operation room is in the central block, and is lighted from the top only. Surrounded as it is entirely by passages and rooms, its ventilation must be a matter of some difficulty. In the wards the beds are coupled, with a single bed placed in the angle of the ward, and there is a sitting-room and bedroom for a nurse attached to each ward. In all the smaller wards, of which there are several, there is no efficient disconnection between the water-closets and the wards.

The London Temperance Hospital, Hampstead Road.—

The plan of this hospital is very different from that of Swansea. Roughly, on the first floor it is in the form of an E, the top and bottom strokes representing respectively the east and west wards, and the centre stroke the operation theatre, while the up stroke is the connecting corridor. At the left-hand lower corner a ward is tacked on and forms a small projection at this part of the letter. The ground floor of the western ward block is occupied by shops which project some distance in front of the ward, and the roofs of which form a promenade for the patients on the first floor. The western wards look on to Hampstead Road, the eastern on to a now disused burial ground which is laid out as a public recreation ground. In the wards, the mistake of coupling the beds has been repeated, and the very imperfect plan of disconnection between the water-closets and the wards to be found at the Herbert Hospital has been copied. The position, also, of the ward which has been referred to as being tacked on to the corner is altogether bad. There is only one window into the open air on one side of it, the others on that side being into the corridor. The disconnection of the water-closets belonging to this block is more imperfect than it is in the other blocks. The out-patient department forms a separate detached building approached through the recreation ground.

Macclesfield Infirmary.—This is another instance of the E form of plan, but in this case there is a wing projecting from the back of the up stroke. The up stroke is represented by the main corridor, which is some twelve feet wide and is provided with fire-places, evidently with the intention of its being used as a day room, for which purpose it is admirably suited. The front part of the administration block is devoted to residences for the staff. The back part contains the kitchen offices on the ground floor, and fever wards and their necessary offices on the upper floor; these are entered from the outside by a separate staircase, and are quite separated from the rest of the building. The ground floor of the western ward pavilion is occupied by the out-patient department. On the upper floors, each ward pavilion contains a ward for sixteen beds, with ward scullery and nurse's room, and the bath-room and water-closets placed in projecting wings with properly cross-ventilated lobbies. An ophthalmic ward, a ward for convalescents, and a special ward are placed on the opposite side of the corridor to the general ward in each case. The laundry and mortuary are detached buildings.

Northampton General Infirmary.—The main portion of this hospital dates back to 1744, and is of a nature to have elicited the remark from Dr. Bristowe and Mr. Holmes that “though more than a century old (in 1863) is of excellent construction.” In plan it is of the E form with the centre stroke omitted, and the wings are joined to the centre part without the intervention of any corridor. The wings are additions. In a building of this date it is scarcely fair to look for arrangements such as would be required now, but it might reasonably have been expected that in an addition made not twenty years ago, the water-closets attached to the wards should have been properly disconnected. A detached building with an underground communication with the main block contains the out-patient department. Another detached building contains the laundry and mortuary.

Oldham Infirmary.—The plan of this hospital consists of a central administration block bisected longitudinally by a corridor, two ward blocks whose axes are at right angles to that of the central block, and which are connected with the latter by a short length of ventilated corridor, and a detached out-patient block of one storey placed behind the central block, midway between the two ward blocks. The central block is three storeys high and the ward blocks two storeys. The central block is compactly arranged and contains the usual offices. The staircases to the upper wards are placed at each end of the central block instead of being actually in the ward blocks—an excellent arrangement well calculated to prevent the circulation of air between the two ward floors. The ward blocks contain each a ward for twelve beds, with closets well cut off from the wards, bath-room, lavatory, nurses’ room and large day-room with bay window facing south. The only points deserving criticism in an otherwise well-planned building are the position of the beds in the wards, which appear to be under instead of between the windows, and the positions of the ward fireplaces, which might with advantage have been placed in the centre of the wards.

Royal Berkshire Hospital, Reading.—On a much larger scale than the London Temperance Hospital, this plan has many points in common with it. The main group of buildings are, like the Temperance Hospital, in the form of the letter E, but with wings added to the up stroke, which is thus produced at each end beyond the cross strokes. The central part of the up stroke is occupied by the administrative offices, the projecting building in the centre being the chapel on the ground floor, and the operation room and

small ward on the first floor. The two wings forming the top and bottom strokes of the **E** are ward pavilions, each of which is divided transversely into two unequal parts by a staircase. Access to these staircases and thence to the wards at the further ends of the wings can be had, either by passing through the nearer wards or through the open courtyards formed between the chapel building and the wings. The smaller wards have a nurse's room which partly projects into the ward and is partly built out, and which is only accessible from the ward. There is also a water-closet with no means of disconnection. The larger wards have each two small wards for one bed, each built out at one side and approached only from the ward. The bath-rooms are built out in similar projections to the nurses' rooms of the smaller wards. At the further end of the larger wards are two projecting buildings, one of which is the nurse's room, and the other contains the water-closets. The arrangement for disconnecting the latter is a modification of the Herbert Hospital plan. By a door at the end of each ground-floor ward the patients have access to the spacious garden. The wings, which have been described as forming continuations of the up stroke of the **E**, are connected to the main building by cross-ventilated corridors, and each contains a ward with two nurses' rooms and water-closets properly disconnected. On the east side of the site, and connected by a basement passage with the main building, are three separate buildings, containing respectively the Home for Trained Nurses, servants' quarters, and the laundry. On the west side are three other separate buildings: (1) the out-patients' department; (2) the mortuary buildings; and (3) a one-storey building containing two small wards for infectious cases.

Royal Infirmary, Preston.—On a somewhat larger scale the principal group of buildings at Preston resembles the plan of Oldham. The central block faces south, and the two ward blocks project at right angles, so as to form three sides of a large quadrangle. The central block contains the residents' quarters, and the offices and the out-patient department, and in a detached block at the back are the laundry, the mortuary, and two "padded rooms." The ward blocks are separated from the central block by about 40 feet, and the width of the quadrangle between the two ward blocks is over 180 feet. A wide corridor connects the central block with the wards, and is ventilated on both sides and provided with doors for access to the grounds. Each ward block is divided into two parts, the staircase being placed at the point of division. The part to

the south of the staircase contains a ward for twenty-four beds with a ward scullery and nurse's room, that to the north contains a ward for eight beds with two single-bed wards for special cases. In each case the water-closets and bath-rooms are properly disconnected, and at the south end of the larger ward is an open loggia accessible from the ward. The beds are coupled, and the fireplaces in the side walls are not arranged with a view of enabling the greatest number of patients to see the fire. In addition to the buildings above described, there is a group of three pavilions placed parallel to each other, and connected by covered ways, which were formerly used as infectious wards (for cases of scarlatina, typhus, and small-pox), but are now occupied as a children's hospital. There is also a detached mortuary building.

Swansea Hospital.—The hospital selected as the typical form of this sub-class is remarkable for the position in which the two ward pavilions are placed in relation to one another. The plan very much resembles the form of a tuning-fork with the prongs widely divergent, the administration block serving for a short handle, and the ward pavilions representing the prongs. The reason for this arrangement is to be found in the peculiar form of the site, which is an irregular-shaped figure like a triangle, whose apex has been roughly rounded off, and whose base has had a large piece cut out of it. The rounded apex has a south-westerly aspect, and here is placed the administration block. The corridor which connects the ward blocks passes at the back of the central block and then curves off to the two pavilions. One of the ward pavilions has its axis pointing N.N.E., the other N.E. by E. The plan is an ingenious one, and succeeds admirably in adapting the hospital buildings to the special condition of the site. The administration block contains all the usual domestic offices and residences for staff, and at the back, separated from the main block by the corridor, is a one-storey building containing the operation room. The ward blocks are identical, except that part of the north block is devoted to the out-patient department. Each consists, with the above reservation, of staircase, smaller ward for eight beds, nurse's room, scullery, main ward for twenty beds, with projecting wings at each angle of the ward containing in one the water-closets and in the other a bath-room. The wards are cross-ventilated, but the beds are coupled. Two detached buildings at the extreme end of the site are respectively the laundry and mortuary, with stable adjoining.

Victoria Infirmary, Glasgow.—This hospital is still in course of extension, and it will possibly be some time before the whole of the buildings are completed. The complete scheme comprises three ward pavilions, one of which, is at the present time, in course of erection. The buildings, as they now stand, take somewhat the form of the letter A. The main entrance is at the apex, and the wards are the lower limbs. The kitchen offices and the nurses' quarters are grouped in the right-hand stroke above the cross-bar, the corresponding part to the left being occupied by the administration block and superintendent's rooms. The cross stroke contains the corridor connecting the two wards, and on the ground floor various receiving rooms, surgeons' and physicians' rooms, clothes store and other offices are ranged along the upper side. The wards run nearly due north and south. Each contains eighteen beds, which are placed singly between the windows. At the entrance to each pavilion are a staircase, a ward for two beds, a nurse's room, and a ward scullery, and between these rooms and the ward a ventilating lobby is interposed. The closets and bath-rooms are built out in projecting towers at the angles of the wards, and between the towers is a balcony accessible from the ward and having a southern aspect. The washhouse, laundry, and mortuary are contained in two detached buildings.

British Hospitals.—Class I, Sub-class IB.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Swansea	120	7'50	100'00	16'00	1,600'00	29'20	871'20
Temperance, London	50	7'25	110'29	13'00	1,443'77	11'36	400'00
Royal Berkshire, Reading	144	8'00	102'15	12'66	1,303'87	22'00	1,210'00
Birkenhead	35	6'00	85'42	13'50	1,155'17	21'42	1,337'14
Macclesfield	80	7'00	101'56	15'75	1,599'57	34'03	1,435'60
Bolton	78	* { 6'00 10'00 }	116'78	17'00	1,985'26	31'82	2,660'07
Oldham	80	10'60	124'58	16'00	1,903'28	37'00	720'00
Preston	108	7'50	100'00	18'00	1,800'00	20'76	2,823'33
Northampton	144	* { 9'00 4'83 }	88'66	14'00	1,241'24	10'31	4,915'62
Ayr	40	7'50	91'30	14'00	1,278'30	21'60	2,450'00
Victoria Infirmary, Glasgow	250	8'00	101'47	15'00	1,522'05	35'75	304'92

* Coupled beds.

† Approximate.

Published plans :—Reading : Bristowe and Holmes, Oppert. Swansea : Oppert, Galton.

Foreign Hospitals.

The Mary Hitchcock Memorial Hospital, Hanover, N.H., U.S.A.—This hospital has been designed by its founder, Mr. Hiram

Hitchcock of New York, who is also a resident of Hanover, and Trustee of Dartmouth College, as a memorial to his deceased wife. It is to be an adjunct to the medical school of the college, to which it is a munificent benefaction as well as to the town and village in which it is placed. It will receive patients also from a considerable section of country in northern New England. The foundations were laid in 1889. The hospital consists of four distinct buildings : a central, or administration block, with an L of two storeys and an attic, two one-storey pavilions connected with the central building by open corridors, and a surgical building designed for the special purposes of the medical college. The capacity of the hospital is thirty-six beds. The material of the exterior of the buildings is Pompeian brick, mottled and yellow-grey in colour, with a brownish tint, and the ornamentations are in terra cotta of a light colour. The roofs are of light red Spanish tiles. The general architectural style is based upon early Italian Renaissance. The central building has a hipped roof with dormers ; and the roofs of the pavilion wards and of the surgical building take a domed form as a natural expression of the fact that there are large rooms beneath them. These forms also grow out of the use, in the interior construction throughout, of the "cohesive system," in which thin vitreous tiles are employed. The ceilings being formed by layers of these tiles as shallow arches, or as domes over the larger rooms, are built up above with like material to make level surfaces for the superimposed floors. All inner partition walls are of brick, and there is a unity of fire-proof construction throughout, largely of vitreous and non-absorptive material, including the outer walls and the supports of floors and roofs. The arched construction sustains all stairways &c., so that no iron is used and there is no woodwork except the slight finishing around the windows and doors, and for base-boards. Where wood-flooring is used it is of hard pine laid upon the fire-proof material. The floors of the main halls, in the administration building and connecting corridors, are of marble mosaic ; and marble and tiling are used in lavatories, water-closets &c., for walls, partitions, and floors. The general wood finish of the administration building is quartered oak ; cypress is used in the rear extension. All the exterior walls are hollow, and the plastering is applied directly to the interior surface of the bricks and tiling, with a finish of "adamant," affording a fine, hard, non-absorptive surface, like cement, which does not check or crack. The basement and foundation walls are of granite of the locality. This system of construction avoids

the use of heavy iron beams, and brick or terra-cotta arches of great weight, and renders the whole structure substantially a fire-proof monolith. It has been recently introduced in America by Mr. Guastavino, an educated Spanish architect, as an adaptation to modern use of the early Italian and Spanish dome-construction. It has been used in part in a number of important buildings, but this is the first one, and the first hospital, in America, which has been planned especially for the use of this method throughout. The architects, Messrs. Rand & Taylor of Boston, have done previous excellent work in the designing of hospitals and asylums. The new Worcester Hospital for the Insane, planned by them, is one of the best examples of the large asylums in America of the modified linear plan that has been so much in vogue in late years. A special pavilion at the New Hampshire Asylum is unique and excellent in its design. In this planning of the Memorial Hospital now described, their instructions have been to spare no reasonable expense for whatever may be desirable to make the hospital a perfect one in all particulars. The cost of the three buildings constituting the hospital proper will approximate \$90,000, and about \$20,000 more for the surgical annexe. Deducting the extra cost of the special fire-proof construction, about \$75,000 would remain, approximately, as a basis of comparison with the cost of a "slow-burning" building of like capacity as commonly built. The administration building particularly has a special memorial character, and is liberally designed; and the materials have been generously chosen for the whole structure. The plan provides for the convenient enlargement of the hospital by additional buildings and extension of corridors.

Site and aspect.—The buildings are situated upon a large open area, including over one hundred acres of land, of which all that is desirable is devoted to the hospital. The aspect is nearly south, with streets at a generous distance on the front and west; and the ground slopes downward from near the building to the east and north. Beyond the street to the west it descends irregularly to the banks of the Connecticut River, one-sixth of a mile away; and there are pleasing views of more distant hills and mountains in this and other directions.

Subsoil, drainage, and water supply.—The foundations of the structure rest upon the top of a bed of clay, under a thin surface layer of sandy loam; next to the group of buildings, on the front and sides, the surface grade is raised to within 4 ft. of the first

or ground floor, and slopes gently to the natural level of the surrounding grounds. In the rear, and in the spaces between the buildings, the surface is near the level of the basement floors. The natural drainage is excellent, and the main sewer leads through a settling tank to a filtration tank near the river at a distance of half a mile. The sewer is of earthenware drain tiles, and at a distance from the buildings a flushing tank is placed. The water-supply is at present furnished in small part by an aqueduct for drinking purposes and the like ; and by collecting the rain-water from the roofs, in cisterns, for common uses.

General arrangement.—The general arrangement of the buildings, with detail of the ground floor throughout, is shown in the portfolio plans. The administration building is in general dimensions 42 ft. by 58 ft. Passing by way of the *porte cochère* and a broad porch, and as one enters the vestibule and the main hall, the entrance offices are upon either side. A cross hall leads, on the right and left, to the wide open corridors forming the connections with the pavilion wings. These main halls are 8 ft. wide. The central rotunda is 16 ft. across each way, and forms a handsome feature of the building. In the rotunda are placed the special adornments ; in an alcove on its farther side there is a fireplace, and above the mantel a memorial tablet. There are seats in the alcove and a low railing at one side. An arched passageway leads to the hall, running backward to the rear extension of the building. The dispensary is next to the surgery, and a work-room in the rear of the former serves as an adjunct for both of them. The matron's living room and office are on this floor. The rear extension is cut off from the front building on the second floor by a cross corridor with a window at each end ; this is at the upper landing of the main stairway ; on the first or ground floor the private bath-room and closets are for the male officers, and have independent provision for effective ventilation. Farther back, beyond the trunk-lift, food-lift to second floor, and ventilation and pipe-shaft, the officers and nurses have their dining-rooms, and beyond these, again, are service-rooms and the back stairway which leads from basement to attic. Last of all, and outside of the northern main wall, an annexe, consisting of one storey and basement, contains the laundry with its special vent-chimney ; in the basement are the wash-room, a separate rinsing-room, and a disinfecting chamber. The basement of the administration building is unused, excepting a matron's linen-room, and room for other stores. The

basement of the extension contains a cold room, a kitchen, and a bakery with an especially capacious vent-chimney, a servants' dining-room &c. The second floor of the main building contains eight rooms for patients. Two of these rooms may contain two beds each for children. All but two of the rooms on the two main floors of this building have each a fireplace. In the second storey of the extension behind the cross corridors are placed a nurses' chamber, and a service-room with a lift connected with the kitchen. Between these rooms a passage leads to the linen- and bath-rooms, and separate closets for patients and nurses; these rooms are connected with the large vent-flues in the kitchen chimney stack. Behind these are servants' rooms on the second floor and in the attic; and in the latter, in front, are three large rooms well lighted and ventilated, with a space for dormitories for ten nurses.

Connecting corridors.—The wings are 35 ft. distant from the main building, and their height is 13 ft. from the floor of the ward to the eaves. The corridors, with a closed basement passage-way, are 12 ft. wide, and are so arranged that, when glazed panels are placed between the pillars, sun-rooms are formed. A large room, with glass sides and roof, is formed alongside the corridor between the east pavilion and the surgical building. This will serve as a sun-room or conservatory, as may be designed.

Pavilions.—The principal sick wards are in the pavilions. The unique shape of the wards is designed to combine the merits of the round and the rectangular forms. They have the advantage of the latter in the arrangement of the furniture &c., and the cutting off of the angles at the four corners with the arching of the ceiling gives the practical effect of the round ward. The small size of the wards, each containing ten beds, aids in gaining this effect. Each pavilion ward is so placed that all of its walls are exposed to light and air, except a few feet at one corner. The southern aspect permits the entrance of the sunlight all day in each ward alike. The principal ward is 28 ft. by 36 ft. in the clear: this allows an average of 100 square feet of floor area for each of the ten beds. The height of the ceiling is 11 ft. at the sides of the room, rising by a short curve to near its maximum height, which is 14 ft. at the centre, where it is pierced by the central chimney. This allows about 1,300 cubic feet of air space per bed. The floors of this building are of hard pine, except in the lavatory and water-closet, where tiles or marble mosaic is used, and the wood finish is simple and of varnished cypress. All corners are rounded, and grooves for the

lodgment of dust are thus avoided. All the corners of the rooms are rounded also, including the joining of the base-boards with the floor, and the corners of the chimney in the large ward. The windows are 3 ft. by $7\frac{2}{3}$ ft. in the clear; giving an average of $19\frac{2}{3}$ sq. ft. per bed of effective glazed surface. There are double runs of sash in the windows of all wards and rooms for patients and all living rooms, as the climate is cold in winter, when a temperature of -25° Fahr. is not infrequent. Each pavilion extends backwards and has a low and moderately sloping roof, affording a series of four rooms 9 ft. by 13 ft., looking to the east and west, in each pavilion respectively. The room nearest the large ward is a sitting-room for the nurse, and the others are for single patients requiring some degree of seclusion &c. Each room has a fireplace as shown in the plan. There is a skylight in the corridor. On the opposite side of the building are the service rooms: first, one for serving food, &c. having a lift from the basement through which is the way to the kitchen; next, the rooms for ward linen and patients' clothing; next, the bath-room, which virtually has two windows, the opening between it and the lavatory extending from floor to ceiling and being only partly closed by a fixed screen. Within this room there is thus formed a small inner room containing water-closet, slop sink, and their special vent shaft; this apartment is thus cut off from the common corridor by a practical lobby. The coldness of the winter climate demands some concession in these arrangements and elsewhere, in order to avoid too much exposure of rooms containing water service. Care has been taken to provide effective and independent ventilation in such places. The basements of the pavilions are open unused spaces with concreted and cemented floors.

Surgical building.—This is a domed structure mainly occupied by an audience room 34 ft. by 34 ft., with an amphitheatre capable of seating 125 persons. The accessory rooms include the waiting and etherising rooms, surgeons' rooms, and, under the seats, a workroom. There is an outside entrance giving access for students. This operating theatre has a large skylight in the northern aspect of the dome, and at the east end of the floor space is a broad bay window affording the side-light sometimes needed. The basement here, with its floor lower than elsewhere, contains the main boiler-room and heating apparatus of the hospital. There is also a boiler for high-pressure steam for heating water, &c. for baths, kitchens, laundry &c., and to heat the disinfecting chamber. Outside of this building the surface grade descends enough to afford conve-

nient entrance to the basement. Against the northern main wall of the building is placed a low building, basement-high, with entrance from the ground level, for the mortuary and autopsy rooms.

Warming.—The rooms are freely provided with fireplaces as indicated in the plans. The heating is mainly effected by a low-pressure steam apparatus, convertible for use with hot water. The indirect system is employed throughout, with encased coils of pipes well distributed through the basements, and arranged with switch valves, &c., for mixing cold and warm air. An average of 3,000 to 5,000 cubic feet of fresh air per hour can be easily furnished for each patient. There are four inlet registers in each of the larger pavilion wards.

Ventilation.—The extraction system is employed in the simplest form, by providing chiefly for a natural upward outflow of the escaping foul air. In each of the large wards two ventilating openings with registers are placed in the chimney close to the ceiling, one over each fireplace. The clear outlet area per bed equals the inlet area, and is 72 square inches. The chimney is occupied mainly by a vent-shaft. The smoke-flue of each fireplace is a round earthen pipe worked into the corners of the chimney. The clear area of the shaft is 32 in. by 36 in., and steam pipes are placed in it above the ventilating openings. The space under the domed roof of the building is ventilated by a small opening into the chimney to secure some change of air; and the roof space is also supplied with a small amount of air through small flues rising in the walls of the building from the basement. Ventilating flues 9 in. in diameter are placed under the floor of the ward, each leading to the base of the chimney from a register under the foot of each bed. For each of the single rooms in the pavilions there is a vent-flue, with top and bottom registers, alongside the chimney, leading to a warmed vent-chamber in the roof. There is a like arrangement for all rooms in the administration building, where a capacious vent-chamber under the roof has its outlet in the top of the tower over the main stairway. The special provisions for independent ventilation of all apartments, for water-closets, kitchens, and service rooms, have been noted.

The plumbing and fittings of water-closets, kitchen sinks, and the like, are all left open to view, or carried in accessible pipe-shafts. All soil-pipes have foot ventilation and extend upwards to the outer air, and they also lead through traps to the sewer system. The water-closets are of the "Hopper" form, holding a large

amount of water in the bowl, and simple in construction, working upon the syphon principle.

Rio Tinto Mine Hospital, near Huelva, Spain.—This hospital, destined for the use of the employés of the Rio Tinto mine, was erected in 1883 from the designs of an English architect, Mr. W. J. Green. It differs from an ordinary English hospital of the type in having verandahs along each side of every building, except the front administration building, whose aspect is north. The entrance is at the ground level, but both the wards and the greater part of the administration are at the first-floor level. The space underneath the wards forms a covered ambulatory for convalescent patients. The basement of the central block contains the receiving-room and porter's office, the kitchen offices and the laundry, and on the first floor are the operation room, nurse's dining-room, surgeon's room, store-rooms, and bedrooms for nurses and servants.

Each ward-wing contains a general ward for twenty-four beds, a special ward for two beds, day-room, nurses' sitting- and bedroom, and the usual offices. In the large wards the beds are coupled, and the sanitary offices are planned in the form of octagons—an arrangement which, as has been pointed out in other instances, serves no good purpose, and involves a sacrifice of useful space in order to gain a certain effect.

Teheran Hospital, Persia.—This small hospital was erected in the year 1890-91, from designs by Mr. Ernest Turner, and presents no special features of interest. It consists of a central administration block, part of which is two storeys in height, and two wings, each wing containing two wards for ten beds each. The operation room is in the administration block at the back, and next to it is a ward for two beds. The wards are of the ordinary type, with windows opposite each other in the side walls, but there are no windows between the end beds and the corners of the wards. The sanitary offices are placed in projecting wings which are, very needlessly, planned in the form of octagons. The result is a waste of space in the earth-closets, and very ill contrived and far too small a space for slop sinks.

Foreign Hospitals.—Class I, Sub-class 1B.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
AUSTRIA.		ft.	ft.	ft.	ft.	ft.	ft.
Vienna, Jews Hospital	100	—	—	—	—	—	—
Wilkowitz in Mähren, Work- men's Hospital	—	—	—	—	—	—	—
BELGIUM.							
Westwezel	—	—	—	—	—	—	—
*Dinant	36	—	†107'50	—	†1,410'40	—	—
GERMAN EMPIRE.							
Berlin, Augusta Hospital ..	80	6'56	89'18	14'76	1,316'29	—	—
Strasburg, Surgical Clinic ..	100	—	—	—	—	—	—
PERSIA.							
Teheran	42	10'00	132'50	—	—	—	2,962'33
SPAIN.							
Rio Tinto Mine, near Huelva ..	52	{ 6'50 10'00 }	104'16	—	—	—	—
UNITED STATES OF AMERICA.							
Hanover, N.H., Mary Hitchcock Memorial Hospital	36	10'00	100'00	13'00	1,300'00	†19'66	12,100'00
Chicago, St. Luke's Hospital ..	‡123	{ 6'00 9'00 }	112'92	—	—	—	—

* Forms part of one establishment with the Hospice.

† Official.

‡ Glass area.

§ Approximate.

|| Coupled beds.

Published Plans :—Vienna : L. Klasen, "Grundriss Vorbilder." Wilkowitz : Max Kraft, "Arbeiter Wohnhäuser." Augusta Hospital : L. Klasen, Romberg, "Zeitschr. f. prakt. Baukunst," 1869; "Deutsch Bauz." 1870; Esse, "Das Augusta Hospital," 1873.

Sub-class 1C.—MULTIPLE PAVILION.

Type :—Wigan Hospital. See page 135.

Blackburn and East Lancashire Infirmary, Blackburn.—The arrangement of the ward pavilions of this hospital is peculiar, and with one or two exceptions has never been adopted in any other building, neither has any satisfactory reason for its adoption ever been put forward. The wards are projected from the corridor alternately, first to the east, then to the west, the corridor itself running north and south. When it is said that the wards *are* arranged in this manner, it should be explained that such is the intention if ever the complete design is carried out. At present, only three pavilions exist out of a total of eight. The central block, which is planned in the form of a Latin cross, through the lower part of the stem of which the main corridor passes, contains on the ground floor a large entrance hall which serves as a board-room. Immediately above this is the main corridor, on the north side is the matron's room, and on the south side a special ward for three beds. Both the last named consist of single storeys only. Beyond

the corridor are a nurses' kitchen, a serving-room, a nurse's bedroom, and a staircase, followed by the out-patient waiting-hall and consulting-rooms. The arm of the cross is occupied by a large hall, dispensary, and dormitory for six night nurses. The latter opens into the hall through which the out-patients pass on their way to and from the consulting-rooms and dispensary. The top of the cross contains the nurses' bath-room and water-closet, the porter's office and the vestibule. On the first floor of this block, over the entrance hall, is a small ward. The lower part of the cross is occupied by an accident ward with nurses' kitchen, a parlour and bedroom adjoining. The central part of the cross-piece is the operation room, and the arms are accident wards. A corridor runs round three sides of the operation room and gives access to two water-closets, a lavatory, and a bath-room. Thus the three wards, the operation room, the water-closets, &c. are all in the closest atmospheric communication. This block has been described thus in detail because it seems difficult to imagine how any arrangement could be much worse ; yet it is a curious fact that this hospital has probably been more frequently illustrated in works on hospital construction than any other. The ward pavilions are also remarkable for their singular defects. The wards open directly on to the corridors, and the ward offices are placed at the extreme end of the wards, jumbled together and with no effort at disconnection between ward and water-closet. The only good point about the plan is that the staircases are separated from the wards by being placed at the other side of the corridor. The plan of alternating the pavilions looks ingenious at first sight, but in reality the only effect it can have is very much to impede the free circulation of air between the several pavilions.

Clayton Hospital, Wakefield.—The plan of this hospital resembles to a certain degree that of Blackburn, in that, of four ward pavilions, two project from one side of the corridor, and two from the other, with a space between each. The buildings are somewhat in the form of the letter **E** with wings tacked on to the corners. The central building has a long frontage and extends on each side to the larger ward pavilions. The main corridor runs from end to end, and the administration offices, residences, and operation room are placed on the north side. The kitchen offices are on the south side, and form the central stroke of the **E**. The two main wards form the top and bottom strokes and project southwards. The ground floor of the east ward contains the out-patient department. The two small buildings which occupy the

extreme east and west ends contain special wards. There is a detached block containing laundry and mortuary.

Derbyshire Royal Infirmary.—The history of this hospital is an eminently instructive one. Erected in 1806, and designed on what were then thought to be the most perfect principles of sanitation and ventilation, in 1891 it has come to be condemned as unfit for habitation, and is now on the eve of demolition. The original building consisted of a large rectangular block of three storeys in height, the lowest storey being, at the time of erection, a half-sunk basement. At a later period the ground around the building was excavated, and the basement then became a ground floor. Part of each floor was allotted to the fever department, and had a separate entrance. On the basement floor were the kitchen offices, public baths, two laundries (one for the general work of the house, the other for the fever wards), "dissecting room" (that is, post mortem room) and two mortuaries. On the ground floor were the board room, rooms for the matron, house surgeon, and pupil, out-patients' room (used also as a chapel), apothecaries' room, and rooms for physicians and surgeons. For general patients there were on this floor two wards, and for fever patients a convalescent room, kitchen and back kitchen, and physician's room. On the upper storey were thirteen wards for general patients, an operation room, with an "operation ward" on each side, two convalescent rooms, nurses' rooms, and sculleries; and four wards for fever cases. On this floor alone there appears to have been a communication between the fever wards and the rest of the house. The water-closets were all in the centre of the house, and were ventilated on a system to be described hereafter. In 1848 a fever wing was added to the south-west of the main block; in 1869 the kitchen offices and operation room were removed to a wing built out to the south of the main block, a detached laundry and mortuary were added, and a ward wing of two storeys was erected at the south-west angle. The chief point of interest about the original building is the system of ventilation and warming which was adopted. In the basement storey was a hot-air stove, constructed on what is known as the "cockle" form. This consists of a central fire-grate, surrounded by a sort of cast-iron dome formed of pipes, which led into a series of brick channels. The air to supply this stove was brought in a brick underground channel, four feet square, from the summit of a tower in the grounds some seventy yards distant, and was distributed all over the hospital by means of channels or shafts built into the walls. The

cockle stove was, at a subsequent period (1857), replaced by a battery of steam pipes, which still exist. There were no fireplaces whatever in the building as it was originally constructed, though these were subsequently added. The fever wing was ventilated and partly warmed on the same system, with this difference—that hot-water pipes were used in place of steam, and fireplaces were provided in the wards. The system of ventilation and warming is described at length in a work published by Charles Sylvester (Longmans, 1819) entitled “*The Philosophy of Domestic Economy*,” in which are complete plans of the original building, with details of the hot-air stove, the drying closet, and roasting oven, and of one of the water-closets. These latter were, as before remarked, in the centre of the building, and must have been quite dark. The lobby entrance to the closet was circular on plan, and the centre was occupied by a revolving post (called by Sylvester an “harbour”), upon which the door was hung. Radiating from this central post was a partition which separated the entrance to the lobby from that to the closet, and the door was so contrived that it had to be pushed through more than three-quarters of the circle before access could be gained to the closet. Over the closet seat was an opening to the extraction-shaft, and the theory was that the air in the closet would be driven up the extraction-shaft by the act of opening the door, and that fresh air would come in from outside to replace that driven out, and that air could not pass out from the closet to the house. The revolving door-post also acted upon the valve for supplying water. In reporting upon this hospital, Dr. Bristowe and Mr. Holmes remark that “the medical men and others complain seriously of the artificial warming and ventilation, but give no tangible proof of any injurious effect arising therefrom.”* It is possible that the fact that at the time when this report was made the cases treated were, to a very large extent, chronic may have something to do with the absence of the “tangible proof” of the mischief that must even then have been brewing. Certain it is that the condition of the hospital had in 1889–90 become so serious that the old buildings had to be abandoned, and the patients removed to temporary huts. It was found that the ventilating shafts were in intimate connection with the drains, and that rats had free access to all parts of the building. The building had, in short, become saturated with septic poison, and it had become impossible with safety to undertake the simplest operations. The

* Sixth Report of the Medical Officer to the Privy Council, 1864.

erection of an entirely new hospital was decided upon, and the foundation-stone was laid by Her Majesty Queen Victoria on May 22, 1891.

The new hospital, when completed, will consist of five ward pavilions, a detached home for nurses, front administration block, kitchen and stores block, detached laundry and boiler-house, out-patient department, operation room, chapel, two lodges, and the mortuary block. Of these, the administration buildings, two ward blocks, operation room, out-patient department, laundry, and mortuary are now (1892) in progress. The remainder of the buildings are deferred for future erection. The main front of the hospital faces north-east, and the site, which is about fourteen acres in extent, falls from the south-west to the north-east. The front administration block, containing the casualty department, offices, and residences for staff, occupies a central position, and is connected by a corridor with the block in which are placed the stores and kitchen offices. At right angles to the latter block is the main corridor, off which are placed the four large ward blocks, the operation room and chapel, with the out-patient department at one end, and the ophthalmic and children's block at the other end. The out-patient department is modelled very much on the lines of that at the Great Northern Central Hospital, with this improvement—that patients can be sent direct from the waiting-hall to the dispensary without passing through any of the consulting-rooms. Each ward pavilion is two storeys in height, well raised above the ground, on an open basement. The main wards are for twenty-four beds each, and in each pavilion is a small ward for two beds. The usual ward offices—scullery, linen-room, clothes store, food cupboard, orderly cupboard, &c.—are all provided, and the water-closets and bath-rooms are placed in towers at the angles of the ward ends. Each ward has also a broad covered verandah. The warming will be partly by open fireplaces, partly by steam coils. One of the future pavilions will be devoted on one floor to the treatment of diseases of women, and will be subdivided into a large ward for ten beds, four wards for one bed each, and one ward for two beds, with an operation room. The pavilion for ophthalmic cases and for children will have an operation room for eye cases attached. The laundry, mortuary, and nurses' home are all entirely separate blocks.

Dumfries and Galloway Royal Infirmary.—The plan of this hospital shows five parallel blocks one behind the other, and all

connected by a central corridor which runs from the front block to the back. The front block contains a central portion and two wings, the central part being devoted to the residential quarters for officers, and the wings containing wards on the upper floors, with the out-patient department in one wing on the ground floor, the other wing containing on this floor the accident ward. The block behind the front building contains two storeys of two wards on each side of the corridor with the staircase and ward offices. The water-closets are directly connected to the wards, and the smaller wards have no cross-ventilation. Beyond this block is a small block containing two day-rooms. The next block is a double ward block similar to the first. The end block contains all the kitchen offices, the laundry, and the mortuary and post-mortem room. The latter are disconnected from the hospital corridor by an open courtyard.

Glamorgan and Monmouthshire Hospital, Cardiff.—The present buildings of this hospital were opened in 1883, when the old hospital was let to the Council of the University College of South Wales. The plan is based on that of Blackburn in respect of the alternating position of the ward blocks. The administrative block faces west, and comprises the residential quarters for the officers, and a large and ill-arranged out-patient department. At the back of the main block is a one-storey wing, containing part of the out-patient department, the operation room and receiving-rooms. Separated from this by a short length of corridor is a one-storey block containing the kitchen offices. To the south of this block is the first ward pavilion; the corridor then passes the kitchen block, and to the north, after an interval, comes the second ward pavilion. The plan provides for two other pavilions, one to the north and another to the south, which are not yet carried out. The existing south pavilion comprises a large ward for twenty beds, all of which, except those in the corners, are coupled, a smaller ward for six beds, and a special ward for two beds. A ward kitchen, a large day-room with a bay window at the south end of the large ward, and water-closets and bath-room forming towers flanking the end of the pavilion. The staircase is within the block, not separated by the corridor as at Blackburn. The northern pavilion is separated from its staircase, and has only two wards, the larger one being for sixteen beds, the smaller for two, and the day-room takes the place of the six-bed ward in the south pavilion. The water-closet arrangements and the provision of linen-room for the wards are

well considered. Two detached blocks are respectively the laundry and mortuary.

Leeds Infirmary.—The main lines of this plan are based, like the North Staffordshire Infirmary, on the Lariboisière type. There is the central courtyard, and on one side three ward pavilions, on the other side two ward pavilions, with a central block of offices. Here, however, the parallel ceases, for the courtyard, besides being much more restricted in area than that at Hartshill, is covered in with a roof and only serves the purpose of restricting the free circulation of air around and about the ward pavilions. Originally intended as a winter garden for the use of convalescent patients, it is now partially occupied as a carpenter's shop and store; and the best thing to do with it would be to sweep it away entirely. The wards are large and contain thirty-two beds, each arranged in pairs. Owing to the steep fall in the ground, there is an extra storey to the buildings on the south side of the site, the first floor at this point corresponding to the ground floor at the north end. This part of the hospital is devoted to the administrative offices, and not only the kitchen and kitchen offices, but the laundry, post-mortem room, and dead-house are all placed in the lower floor of a building which is in most ample and direct communication with the wards above. And this extraordinary arrangement is, as Mr. Snell justly points out, rendered more incomprehensible still when the fact that some £15,000 worth of "surplus land," was disposed of by the hospital authorities.

North Riding Infirmary, Middlesbrough.—From the rough diagram, which is all that has been obtainable in the way of plans of this hospital, it would appear that it consists of three main parallel blocks connected by a corridor, the centre block being administrative, the other two double ward pavilions. The building was opened in 1864, and considerably added to in 1874, and again in 1881.

North Staffordshire Infirmary, Hartshill, Stoke-upon-Trent.—The hospital now to be described follows to a certain extent, in its general arrangement, the plan of the famous Lariboisière Hospital at Paris. A corridor, one storey in height, runs around four sides of a large oblong courtyard. At the south end of this courtyard is the main entrance block, with offices and residences for the staff. At the back of this, and separated from it by the corridor, is a small building projecting into the courtyard and containing library, museum, and operation room. At the four corners of the parallelogram formed by the corridor, four ward pavilions,

running east and west, project, and centrally between each pair is a smaller pavilion. At the north end of the courtyard, corresponding to the building containing the museum, are the kitchen and scullery, and above these, to the north of the corridor, are the matron's quarters and the nurses' rooms. The spaces between the administrative ends of the ward pavilions are filled with one-storey buildings containing day-rooms and small wards. The larger wards contain twenty-two beds each, some of which are coupled, others arranged singly, and the water-closets are all cut off by cross-ventilated lobbies. The ground floor of the south-western ward pavilion is devoted to the out-patient department. Each ward pavilion has its own staircase and lift, and to each ward is provided a nurse's room and ward scullery. Besides the buildings described above, there are two detached fever blocks, of two storeys, with two wards each of six beds, a small detached block (the Victoria wards) for special operation cases, a detached laundry, and a mortuary block.

Rotherham Hospital.—This hospital comprises seven blocks of buildings which are arranged about a corridor planned in the form of a T. At the base of the T is a block containing the officers' quarters and the out-patient department. Behind this, and forming a projection on each side below the junction of the up stroke with the top, is a one-storey building containing on one side the operation room, accident-room, and room adjoining, and on the other the kitchen offices and laundry. Three ward pavilions of varying sizes are placed at right angles to the corridor which forms the top of the T, and in the interspaces between the pavilions are small special wards. At each end of this corridor is another small special ward.

Royal Infirmary, Edinburgh.—This large and important hospital derives especial interest from the fact that it possesses one of the largest and most perfectly appointed medical schools in Great Britain. The arrangement of the several buildings cannot well be described without reference to the plan, and it should be borne in mind that the fall of the ground from west to east is so great, that what is ground floor at the west becomes second floor at the east. The most noticeable thing about the plan is the distinct separation that is made between the medical and surgical wards. All the four pavilions to the east contain medical wards only, and all the six pavilions to the west contain surgical patients only. The buildings, therefore, are divided into two hospitals, one for surgical, the other for medical cases, with the administration block interposed. The latter building is mainly the old "George Watson's

Hospital," the rest of the hospital having been rebuilt in 1870-79. The original design (published in the "Builder," December 17, 1870), included a separate fever hospital on the south side of the site, but this was never carried out. The general administration offices, the residences for the medical staff, the Lady Superintendent, and the chaplain, the chapel, and the ward for sick students, are all placed in the central block. The arrangement of the offices appurtenant to the ward pavilions is practically the same in both medical and surgical wards. Immediately adjoining the ward is on one hand a nurse's room, on the other a "doctor's room;" next to the former is a day-room, then a bath-room, and then the staircase. Adjoining the doctor's room is a two-bed separation ward, a duty-room, and (facing the main corridor) a food lift, a passenger lift, and dust and linen shoots. The water-closets and bath-rooms are in circular turrets, built out at the angles of the wards—an arrangement by which an effect, characteristic enough of Scotch baronial architecture, is gained at the expense of the convenient placing of the various offices. Adjoining the surgical wards are two operation theatres, and adjoining the medical wards are two large lecture theatres. Separate blocks are devoted to the pathological department, the mortuary, and the laundry.

Royal Southern Hospital, Liverpool.—This hospital occupies a very restricted site, bounded on all four sides by streets. At the first floor level the plan assumes the form of the letter H, with the two lower limbs about half the length of the upper ones, and with a straight narrow block detached and placed at right angles below the H. Buildings of one storey only on the ground floor connect these two together. The main entrance is in the centre of the block referred to above as being detached, and is on the west side of the site. This block contains all the administrative offices (except the kitchen offices) and the out-patient department. The kitchen offices are on the ground floor of the lower or shorter arm of the H on the north side. From the centre of the central block, a one-storey corridor gives access to the cross corridor which connects the two ward pavilions. The cross corridor (answering to the cross-piece of the H) runs right through and has at each end a staircase. On the upper or east side of the corridor are placed, in the centre, the dead-house; on one side, the post-mortem room and museum, and on the other, the dispensary. There is a communication from the corridor with the post-mortem room and dead-house through the museum—a most objectionable arrangement,

and one which might readily have been avoided. Above the mortuary is the operation room with a bath-room, on one side and a small ward on the other. The wards contain twenty-six and seventy-two beds respectively, and have each a ward scullery and nurses' room attached. The water-closets and bath-rooms are at the extreme ends of the wards and are not disconnected.

St. Thomas's Hospital, London.—The palatial structure which now faces the Houses of Parliament from the Surrey side of the Thames is the lineal descendant of a small hospitium or asylum for aged and infirm, founded by Peter des Roches, Bishop of Winchester, about the year 1213 A.D. This building occupied a portion of the site afterwards for so many years the home of St. Thomas's Hospital, until it was, in 1862, dispossessed by the South-Eastern Railway Company. In the year 1551 the Mayor and Corporation of London bought the Manor of Southwark from King Edward VI. ; included in this purchase was St. Thomas's Hospital, which the Corporation at once set to work to enlarge and repair at a cost of £1,100, and in 1553 the king granted it, with the hospitals of St. Bartholomew, Bridewell, and Bethlehem, and Christ's Hospital, a charter of incorporation. These five hospitals were henceforth known as the Royal Hospitals. The great fire of London in 1666, while it did no injury to the hospital itself, inflicted much damage on some of its property, so that by this cause, and also in consequence of three great fires in Southwark in 1676, 1681, and 1689, the revenues of the charity were seriously impoverished. Furthermore the buildings were very ancient, and to a large extent quite unfit for the reception of sick persons. All these circumstances combined to render it necessary to reconstruct the hospital, and to appeal to the public for funds for the purpose. Accordingly, in 1693 the first portion of the new hospital was erected, followed at intervals by additions, until about the year 1732, from which time the buildings as they then stood remained, until removed in 1862. The present hospital was commenced in the year 1866, and the buildings were opened for the reception of patients in 1871. The site consists of a strip of land about eight and a half acres in area on the Surrey side of the Thames, extending from Westminster Bridge towards Lambeth Bridge, about half of this land having been reclaimed from the Thames when the right bank of the river was embanked at this point. The hospital proper consists of six ward pavilions four storeys high, with attics in addition, the longer axes of which are nearly due east and west. At the west or river

end these pavilions are connected by an open colonnade ; at the east end each pavilion has its own block of offices, the interspaces between which are occupied by buildings partly of one storey, partly of three storeys, containing various administrative offices. The detached block close to Westminster Bridge is the treasurer's house and offices. The out-patient department is placed in the one-storey buildings facing Palace Road. The ward pavilions are all, except the one at the extreme north, exactly alike. Each has an administrative block at the corridor end, in which is a staircase, a lift, a small ward for two beds, a ward kitchen, and a nurse's room. The wards contain twenty-eight beds, arranged singly with alternating windows, and the closets and bath-rooms are placed in the towers, which flank the ends of the pavilions and form a conspicuous feature in the river-front. At the river end is an arcaded balcony. The northern pavilion is smaller than the others, and is usually devoted to infectious cases. In the southern pavilion two wards have been set apart for foreign patients, and a separate entrance is provided thereto. The block between this pavilion and the next is the Nightingale Home for Trained Nurses. The buildings at the extreme northern point of the site are those of the Medical School. The vast area covered by the buildings of this hospital render the task of description a very difficult one ; and the plan can only really be understood by a careful study of the first-floor plan in comparison with that of the ground floor. Few hospitals have been subjected to such excessive praise on the one hand and unsparing blame on the other. It is certainly in advance in many ways of anything that existed in London before ; on the other hand it cannot be regarded as a model of good, and certainly not of economic planning. The selection of the site must be held responsible for much that is bad, and to a great extent also for the enormous cost of erection. No less a sum than £48,545 was sunk into the earth before one brick was laid upon another. The total cost per bed was £777, of which £85 is attributable to the foundations ; but even when this latter charge is deducted there still remains the very large sum of £692 per bed as the cost of buildings only. Inasmuch as the direct result of so large an expenditure was that the governors were unable to open some of the wards, for lack of funds to support them when built, this excessive expenditure was on all grounds most regrettable.

South Devon and East Cornwall Hospital, Plymouth.—This hospital was erected in 1883-4, and consists of a central admini-

stration block and two ward blocks of two storeys, with a third block of one storey. The administration block and the two-storey wards together form the letter **E**, the one-storey ward being added on to one corner and placed at an angle to the other blocks. The eastern ward block contains a general ward for sixteen beds, a smaller corridor ward for five beds, nurse's room, ward kitchen, store, day-room and staircase. The water-closets and bath-rooms are placed in towers at the angle of the wards. The south ends of the wards are also provided with balconies, with doors leading on to them from the wards. The western two-storey pavilion has general wards for sixteen beds each, special wards for two beds, nurse's room, ward kitchen, staircase and day-room. The one-storey pavilion is like the last, with the omission of day-room and staircase. The out-patient department is in the central block, and there are detached a mortuary and a laundry.

Sunderland Infirmary.—This hospital differs from most of the class in plan. There are four double pavilions joined by a continuous corridor and a central administration block of irregular form. The hospital was built in 1870, and as first arranged consisted of a symmetrical central block with a corridor on each side connecting it to two double ward pavilions. In 1880 two additional double pavilions were added—one to the east, the other to the west—and the corridors connecting these pavilions to the original pavilions. Additions were also made to the central block, in which are the administration offices, out-patient department, and chapel. The two older ward blocks contain each two wards and two ward kitchens. The lavatories and bath-rooms and the water-closets are placed at the ends of the wards, but are not disconnected. The new eastern pavilion has two wards for twelve beds each, two day-rooms and two ward kitchens, and the water-closets are properly disconnected. The new western pavilion has one ward for twelve children, ward kitchen and day-room, operation room with waiting-room attached, museum and three wards of two beds each.

Western Infirmary, Glasgow.—In general arrangement this large hospital more nearly resembles the plan of Wigan than any other. Supposing the plan of Wigan to be reversed so that the administration block should face north instead of south, and the existing north pavilion were cut short by the omission of the ward, the form of the central part of Glasgow would be fairly reproduced. The shortened ward pavilion becomes the main entrance and administration block, while the block answering to the front block at

Wigan becomes the laundry. The ward pavilions take the form of a cross joined on at each side of the central block. In the centre of the cross are the staircase and lift, a separation ward, and a large open space ; to east, west, north and south, the wards radiate from this point. Each ward has its own ward kitchen, two have nurses' rooms, and one has a separation ward. The beds are arranged singly, and the wards are cross-ventilated ; but the separation of the water-closets is very imperfect. The whole of the wards communicate through the central block with one another. The upper floors of the northern part of the central block are devoted to sick wards ; there are thus nine different ward pavilions, five of which run north and south, the remainder east and west. There is a detached block of erysipelas wards, another contains the medical superintendent's residence, in a third are the nurses' quarters, and in a fourth the mortuary and school department.

Wigan Hospital.—The sub-class now under consideration will be found to include hospitals of several different plans, the only feature in common to all being the existence of several ward pavilions of different forms, and arranged in many different ways in relation to one another. The hospital selected as the first of the three typical plans presents in its main features the form of a cross, with the front portion of the administration building forming a base, and three ward pavilions the arms and top. The main front building contains the out-patient department offices and residential quarters for staff. At the back of this block is a courtyard, on each side of which is a corridor extending up to the cross corridor which gives access to the ward pavilions. Between these two corridors, and beyond the courtyard referred to, are the kitchen offices, and at the angles formed by the junction of the corridors from the front block with the ward corridor are two one-storey annexes—that on the east side being the nurses' day-room and a store-room, that on the west the receiving-room with dressing-room adjoining. The eastern and western ward pavilions are identical in every respect. Each contains a general ward for ten beds, a ward for special cases with five beds, a large day-room, nurses' room, and ward scullery. In the general wards, the water-closets and bath-rooms are projected out at an angle of 45° from the corners of the ward, and are properly cut off by cross-ventilated lobbies. In the case of the smaller wards, the same important condition is not fulfilled. The north ward pavilion is two storeys in height, and has on each floor a general ward of fourteen beds, a scullery, a small

ward for one bed, and a surgery. The operation room is on the ground floor, and extends in height through the upper floor also. A lift affords access to it for patients from the upper ward.

British Hospitals.—Class I, Sub-class 1C.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Wigan	60	6'95	* { 100'80 150'00 }	14'00	* { 1 411'20 2,100'00 }	32'40	‡5,082'00
Derbyshire Royal Infirmary ..	230	10'00	145'00	14'25	2,066'25	38'50	2,484'67
Royal Infirmary, Edinburgh† ..	586	9'00	149'00	{ 13'50 14'75 15'00 }	{ 2,015'00 2,201'00 2,239'00 }	{ 34'95 38'85 30'19 }	888'00
St. Thomas's, London	573	8'00	120'00	15'00	1,800'00	45'22	665'35
South Devon and East Cornwall	118	8'16	105'56	14'00	1,476'44	24'00	1,292'03
Sunderland	—	8'00	116'66	14'00	1,613'24	22'91	—
Blackburn	154	9'75	106'00	16'00	1,696'00	33'87	2,262'00
Liverpool, Royal Southern ..	200	5'50	115'90	15'50	1 796'45	39'36	256'65
North Staffordshire	211	10'00	102'27	15'00	1,534'05	28'31	2,064'95
Clayton, Wakefield	56	5'00	†100'00	15'00	†1,500'00	†46'14	1,542'84
Leeds †	328	7'41	107'00	{ 16'50 19'50 }	{ 1,763'00 2 083'00 }	{ 22'16 26'00 }	512'00
Middlesbrough	60	8'00	109'09	15'00	1,616'35	36'81	1,542'75
Cardiff	120	8'00	104'00	14'00	1,456'00	20'25	1,361'25
Dumfries and Galloway	660	9'00	—	—	—	—	‡759'00
Rotherham	42	—	—	15'00	—	—	—
Western Infirmary, Glasgow† ..	388	7'83	106'00	15'00	1,620'00	26'22	1,386'00

* Highest and lowest.

† Approximate.

‡ Snell, *op. cit.*

Published plans:—Blackburn: Oppert, Mouat and Snell, Husson. Leeds: Oppert, Mouat and Snell, Galton. Edinburgh: Oppert, Mouat and Snell. Glasgow: Mouat and Snell, Bristowe and Holmes. St. Thomas's: Mouat and Snell, "R.I.B.A. Transactions."

Foreign Hospitals.

Civil and Military Hospital, Montpellier.—The ancient Hospital of St. Eloi was established in the year 1183 in a suburb of Montpellier; in 1598 it was transferred to the house of a citizen named Jean Christol, whence, at the beginning of the 17th century, it was moved to the ancient "École Mage," the buildings of which were enlarged, and where it remained up to about the year 1884, when the new hospital, now to be described, was opened for patients. The new hospital was designed by M. Tollet, and is one of the most complete examples of his system. The principles of the system will be described later on (see p. 156, St. Denis Hospital). The buildings consist of a main group of eight ward-pavilions, four on each side of a central courtyard. The axes of these pavilions are almost north-west and south-east, and their ends, which abut on the courtyard, are connected by a covered corridor. The central part of the courtyard is occupied by the administration offices, dispensary, laboratory, out-patient department and resident officers' quarters. At the back of these, a wing projecting north-

wards contains the kitchen offices, and beyond this, again, is a building in the form of a cross, which contains the baths. Three detached buildings at the northern angle of the site contain wards for contagious cases. At the north-east end of the courtyard is the chapel, behind which is the community house for the nursing sisters. Other detached buildings are devoted respectively to the maternity department with its small dependent infirmary, wash-house, mortuary, disinfection house, block for paying patients, porter's lodge, &c. Each ward pavilion is divided into two equal parts; in the centre is the entrance hall, with staircase down to the basement storey, room for medical officer, nurse's room, two small wards to be used either for paying patients or as separation wards, and a ward kitchen. Projecting out at one side is a *tisanerie* having on each side of it two water-closets, a bath-room and a lavatory; in each of the latter is a hopper for sending dirty linen to the basement. Each main ward contains twenty-six beds, and at the end of each are two wards for two beds each. The central part of the basement storey (which is really a ground story, as it is entirely out of the ground), contains store-rooms and the heating apparatus. The greater part of the space under the wards forms a covered recreation ground for convalescents. At each end are dormitories for convalescent patients, with dining-rooms attached. On the level of the ward floor a broad balcony runs down the whole length of each ward at each side. The small buildings for contagious diseases have no basements. Each contains two wards for nine beds and four wards for two beds, and two wards for one bed each, with the usual offices. The maternity building is arranged in the form of a \perp . The left arm is a large ward for ten beds; the right contains five rooms with two beds each, all communicating. In the centre are the entrance hall, and two rooms for nurses. These rooms all communicate with a covered way, which also affords access to the buildings in the up-stroke. These latter are two in number, and are detached from the front building and from each other. The building at the further end contains an "amphithéâtre d'accouchement," on one side of which is a ward or "chambre de repos," with linen-room attached, and on the other an instrument-room and store. All the water-closets for this department are entirely detached. The infirmary of the maternity department contains six single-bed wards with two nurse's rooms. In a detached block are the linen-room, scullery, bath-room and drug-room. Two water-closets and a disinfection-house are also

detached. All these buildings are connected together by open covered ways. The mortuary building contains, besides the mortuary chamber, a large autopsy theatre, a post-mortem room, a dressing-room for students and one for the professor, a histological laboratory, two smaller laboratories, and cages for animals. In the administration building, besides the offices already indicated, there are two theatres, one for operations, the other for the medical clinic. Annexed to the operation theatre are a small ward for patients after operation, a surgeon's room, and an instrument-room.

The Moses Taylor Hospital, Scranton, Pa.—The plan upon which this hospital is designed resembles that of Blackburn in having its ward pavilions not placed opposite to each other, but alternating. The buildings are ten in number, and consist of: (1) administration; (2) three ward pavilions for general cases; (3) two smaller pavilions for fever cases; (4) kitchen offices; (5) mortuary; (6) laundry; and (7) two cottages for infectious diseases. The administration building, the three large ward pavilions, and the kitchen offices are connected by a covered corridor, the other buildings are isolated. The administration building contains the offices, reception and examination room, dispensary and residence for staff. Each ward pavilion contains a ward for twenty-four beds, convalescent room, physicians' room, nurses' room, with bath-room and water-closets in a projecting wing. A special feature here is, that to each ward is attached, not only an ordinary bath-room, but also a Turkish and a Russian bath. At the end of each ward is a verandah, with steps leading down into the garden. The small fever blocks contain each a ward for six beds, with nurse's room and bath-room. The ventilation in the large wards is on the propulsion system. Air is drawn down through a tower at one angle of the ward by a fan worked by an engine in the basement, and calculated to supply 6,000 cubic feet of air per minute. Before entering the ward, the air is warmed by passing over coils, through which the exhaust steam from the engine passes, and which can be supplemented when necessary by live steam. From thence the air passes into and fills the basement, then passing over eight supplementary coils it enters the ward through registers under each window. The extraction of vitiated air is provided for by a shaft similar in area and opposite to the intake shaft, and by three circular openings, with lowered turrets, in the roof. Each of these extract shafts is provided with steam coils. It is calculated that the actual amount of air supplied after allowing for loss by friction amounts to 7,500 cubic feet per patient per hour.

The Prince Alfred Hospital, Sydney, N.S.W.—This large and important hospital, which, when complete, will contain some 350 beds, stands upon a site of about eleven acres in extent. The main group of buildings forming the hospital proper are nine in number, and consist of the main administration block, kitchen, and bath-house, six ward pavilions, and the operation block. All these communicate by means of a colonnade open at the sides. The other buildings, which are detached, comprise a group of small wards for infectious cases, the medical school, the mortuary building, and the laundry. The main administration block is four storeys in height. In the basement, the front part contains kitchen offices for the resident staff, and consulting-rooms for out-patients; the centre portion is the out-patients' waiting-hall, and the back part contains the dispensary, drug store, &c. On the ground floor, in the front part, are board rooms and offices; the central part is the "taking-in" room, and the back part contains the matron's office, splint-room, and two accident wards (one for each sex), with nurses' room and bath-room attached. On the first and second floors the front part is devoted to the rooms for resident staff, the centre portion is the chapel, and the back part first and second floors contains the matron's rooms, linen-rooms, and servants' bedrooms. The ward pavilions each contain one large ward for thirty beds, and a small ward for one bed, sisters' room, ward kitchen, bath-rooms, water-closets, &c. On each side, for the entire length of the block, is a verandah ten feet wide. The staircase is approached from outside the building only, but this excellent arrangement is, curiously enough, somewhat neutralised by the fact that free communication between the two floors is provided by a lift, which is placed in the centre of the corridor between the sisters' room and the ward kitchen. The bedrooms for the nursing staff (except the sisters who sleep next their wards) and servants are provided in a second floor over the administrative end of the pavilion. The smaller pavilions are similar to the larger ones in all respects, except that the wards contain seventeen beds instead of thirty. The operation block is two storeys in height. The ground floor contains the ophthalmic department, consisting of two wards for twelve beds each, a nurse's room, a ward kitchen, and the operation room, with an ante-room containing four beds for serious cases after operation. On the upper floor is the general operation theatre, with an ante-room for administering anæsthetics, a surgeon's room, and a waiting-room for visitors and students, four single-bed wards, with two nurses' rooms. The infectious diseases buildings consist of two

ward huts, nurses' quarters, a day-room for each sex, and a bath-room. The mortuary building consists of four rooms—the dead-house, mortuary chamber, where bodies will be placed for the inspection of friends and for inquests, post-mortem room, and pathologist's room and lavatory. The medical school building comprises a large lecture theatre, with lecturer's room, museum, dissecting-room, pathological department, injecting-room, and library.

Sabbatsberg New Hospital, Stockholm.—This hospital was opened for the reception of the sick in January 1879. The site, consisting of about 17 acres, has an open position on an elevated plateau in the north-western suburb of the town. It consists of eight buildings connected with one another by low covered corridors, of which six are ward pavilions, one is the administration building, and one the kitchen and domestic offices. Besides this group of buildings there are four detached blocks, viz. :—the wash-house, stable, mortuary, and summer barrack. From the administration block, which faces north, a covered corridor leads to the domestic offices behind. At right angles to this corridor another one extends from east to west, terminating at each end in a pavilion projecting towards the north. From the last-named covered way a further passage extends at right angles towards the south, and joins another corridor extending east and west, from which the remaining four pavilions project towards the south. Thus, all the pavilions are placed with their longer axes as nearly as possible north and south. The distance between the south pavilions is about 97 ft., and that between the north pavilions and the administration block 72 ft. The administration block contains on the ground floor the board-room and offices, reception and examination rooms, operation room with two small wards, and a nurse's room adjoining, and in the basement the boiler and engine-rooms for electric lighting, dispensary, and store-rooms. On the upper storey are dwelling-rooms for the resident officers. The domestic office block contains in the basement the boiler and engine-rooms for heating purposes and for electric lighting, the apparatus for driving fresh warmed air to the wards, and the stove for disinfecting apparatus. On the ground floor are the kitchen offices, bath-rooms, and the disinfecting room. The ward pavilions are two storeys in height, the upper storey being in each case approached from the corridor direct. At the entrance end of the pavilion is a small ward with a water-closet entered from the lobby which is so placed that it cannot be lighted except artificially, and of which the only means

Foreign Hospitals.—Class I, Sub-class 1C.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
BELGIUM.							
Brussels, St. Jean*	653	—	107'33	13'00	1,287'96	—	—
Mons, Civil Hospital	146	9'00	120'02	16'40	1,968'32	—	—
Molenbeek, St. Jean	155	7'25	101'11	—	2,256'64	—	701'04
Nivelles	—	—	—	—	—	—	—
Bougerhout	—	9'00	117'71	—	—	—	—
FRANCE.							
Hôtel Dieu, Paris	†566	†8'33	†125'00	—	{ 2,222'00 2,254'00 2,411'00	{ †15'92 18'42 19'63	†409'00
Lariboisière, Paris	†704	†7'10	†115'00	—	{ 1,850'00 † 1,965'00	{ † 14'91 16'13 17'03	838'52
Beaujon, Paris	432	—	—	—	1,481'7	—	—
Tenon (Menilmontant), Paris	825	†7'00	†107'00	—	{ † 1,816'00 2,030'00	{ †17'64 19'05	688'16
Civil Hospital, Havre	—	—	—	—	—	—	—
La Conception, Marseilles ..	—	—	—	—	—	—	—
St. Eloi, Montpellier	†600	†7'18	†108'00	—	†2,328'00	†16'57	†1,615'00
Bourges (Military)	†216	†6'91	†85'00	—	†1,693'00	—	†2,490'00
Bichât, Paris	184	†7'25	†107'00	—	†2,245'00	†17'75	454'89
St. Germain en Laye	400	—	—	—	1,970'56	—	530'22
St. André, Bordeaux	650	—	84'00	16'40	1,377'60	—	83'42
Brest	430	—	—	—	—	—	—
La Reconnaissance, Garches ..	316	—	—	—	—	—	—
Guadeloupe (Isle of)	—	—	—	—	—	—	—
Lille	580	—	—	—	—	—	—
GERMAN EMPIRE.							
Royal Surgical Clinic, Berlin ..	—	—	—	—	—	—	—
Borough Hospital, Dresden ..	260	7'08	119'00	—	2,038'00	—	—
Munich, Borough General Hospital, on the right bank of the Isar	237	—	—	—	—	—	—
GREECE.							
Egina, Lazaretto	—	—	—	—	—	—	—
ITALY.							
Genoa, St. André	120	—	—	—	—	—	—
RUSSIA.							
Town Hospital, Riga	400	5'75	86'00	—	1,522'00	—	1,164'00
SPAIN.							
Madrid, Princess Hospital ..	350	3'55	37'27	14'50	540'41	—	—
SWEDEN.							
Stockholm, Sabbatsberg Hos- pital	300	{ 7'54 4'02 }	80'74	13'00	1,049'62	16'48	2,468'40
UNITED STATES OF AMERICA.							
New York, Roosevelt Hospital ..	—	—	—	—	—	—	—
Scranton, Pennsylvania, Moses Taylor Hospital	84	7'50	106'00	16'00	1,696'00	18'00	3,125'00
Cincinnati	—	—	—	—	—	—	—

* Oppert.

† Figures quoted from Mouat and Snell.

Published Plans:—Brusse's: Erkbau, "Zeitschrift f. Bauwesen." Hôtel-Dieu: Mouat and Snell; "Paris, Edifices Sanitaires"; Klasen. Lariboisière: Mouat and Snell; "Paris, Edifices Sanitaires"; Klasen; "Builder" (25.6.59); Husson; Arnould, "Nouveaux Eléments d'Hygiène"; Oppert. Beaujon: Husson; Oppert. Tenon: Mouat and Snell; "Paris, Edifices Sanitaires." St. Eloi: Mouat and Snell; "L'Hygiène en France," 1882. Bourges: Mouat and Snell; "L'Hygiène en France." Bichât: "L'Hygiène en France." Bordeaux: "Choix d'Edifices publics, 1836. Brest: Klasen. Garches: Erkbau, "Zeitschrift f. Bauwesen." Guadeloupe: "Revue Générale de l'Architecture," 1847. Dresden: Friedrich; "Deutsch. Bauz.," 1872, L. Klasen. Munich: Zaubzer and Mayer, "Das städtische allgemeine Krankenhaus." Egina: "Revue Générale de l'Architecture," 1840. Genoa: "La Semaine des Constructions," 1876. Riga: Waldhauer; "Zeitschrift für Bauwesen," L. Klasen.

of ventilation is into the extraction-shaft. There are also a nurse's room, a kitchen, a bath-room, a lavatory which has no window, two water closets, and a urinal. The wards each contain twenty-four beds, which are placed in pairs between the windows. The wards are warmed by means of four steam stoves, two at each end, and extraction-flues, the openings to which are at the floor level, are placed in the walls behind each bed, and open into a main trunk running under the ceiling, which, in turn, connects with two large exhaust-flues in the centre of the entrance part of the pavilion. The steam stoves are cylindrical in form, and have in the centre a circular space for air. Around it is an annular space into which steam is admitted, and at the bottom is a valve for regulating the admission of fresh air. The walls of the ward are panelled with wood to a height of seven feet, and the floors are of wood and wax-polished. At the south end of the ward is a day-room.

Colonial Hospitals.—Class I, Sub-class 1C.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Sydney, Prince Alfred Hospital ..	356	8'00	124'00	16'00 {	*1,284'00 †1,870'00	38'86	1,345'95
Melbourne	344	—	—	—	—	—	601'48

* Ground floor wards.

† First floor wards.

Sub-class 1D.—HOSPITALS WITH CIRCULAR WARDS.

Of this, the most recent development of hospital planning, only nine examples exist, and of these two (Liverpool Royal Infirmary and the Great Northern Central Hospital, London) belong to the next sub-class of hospitals with both circular and rectangular wards. One, the Cancer Hospital of New York is a special hospital, and three—Greenwich, Milton, and Seaforth—are small, and come within the category of cottage hospitals. The remaining three, of each of which the plan is given, are Hastings, Burnley, and Antwerp.

Hastings Hospital occupies a very small, though a very conspicuous, site on the sea front. The site is bounded on three sides by roads, and, as the ground at the back or north side rises very rapidly, it is very much shut in towards the north and east. The south front, of course, faces the Channel. The building consists of

a central block, five storeys in height, with a circular tower to the east, and one at the west, and a wing projecting to the north. The central block provides accommodation for the resident staff, and contains the kitchen offices (on the top floor), the ward kitchens, and some small wards. The ward pavilions are joined to the central block by corridors opening on the south side on to balconies, and having on the north side cupboards for patients' clothes, ward linen, and food. These corridors are about 8 ft. high, and there is a clear space of some 4 ft. between the roof of one corridor and the floor of the one above. The wards are 42 ft. in diameter, and contain twelve beds each,* and the water-closets, sink, and bath-rooms are placed in towers projecting out towards the north and north-east, with cross-ventilated lobbies intervening between them and the wards. The ground floor of the western circular pavilion is occupied by the out-patient department, an arrangement much to be regretted, but, owing to the restricted nature of the site, wholly unavoidable. The roofs of the ward pavilions are flat and paved with asphalte, and in the centre of each, constructed about the stack which contains the smoke and ventilation flues, is a covered shelter or sun-room. The wing at the north contains the casualty-room and operation room on the ground floor, and on the first and second floors separation wards, cut off from the main block by a cross-ventilated lobby. The mortuary and post-mortem room form a separate detached building, as far from the rest of the hospital as the limits of the site permit.

The Victoria Hospital, Burnley.—The site upon which this hospital stands consists of two acres of ground, surrounded on all four sides by roads, and is as ample as that of Hastings is confined. The buildings at present consist of a central administration block and three ward pavilions. The central block is three storeys in height, and is entirely devoted to administrative purposes, with the exception that the operation room occupies one corner of the ground floor. The kitchens and laundry occupy a projecting wing at the back, of one storey in height. The main corridor bisects the main front building and connects the ward pavilions, which are placed on each side of the front block. The pavilion to the right hand, looking towards the front block, consists of a rectangular block, divided in two parts by the corridor, and of two circular wards. The central portion contains two ward sculleries, two small wards, a

* The fireplaces (three in number) and the smoke and ventilation flues are arranged in a hexagonal block 6 ft. 6 in. across the widest part, in the centre of the wards.

nurse's room, a bath-room for the children's ward, and space for staircase. The front ward is 60 ft. in diameter and contains twenty beds. In the centre is a large circular block enclosing a staircase to the roof and the smoke and ventilation flues. This block is 16 ft. in diameter, and must present a very unsightly appearance in the ward. The stoves are detached from the wall, and stand out independently on the floor. The flues descend, and crossing the annular space containing the staircase, enter the stack in the centre. The water-closets, bath-room, &c. are placed in a projecting building with disconnecting lobby. The children's ward is 39 ft. 6 in. in diameter, and holds fourteen beds. The centre of this ward is occupied by a small circular stack of flues only. There is no staircase. The ward block on the other side is exactly like the large ward described above, and the roofs of both these wards are flat. In the centre of each roof is a large annular sun-room enclosed at the sides. The roof of the children's ward is slated. At the back of the left-hand ward is a wing containing the out-patient department. In the future it is intended to erect four more ward pavilions of the same size as the present large wards.

British Hospitals.—Class I, Sub-class 1D.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cu'ic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Hastings Hospital	75	10'25	115'45	12'25	1,414'26	24'37	200'29
Burnley (incomplete) .. .	—	8'00	131'30	15'00	1,969'50	34'05	—

Foreign Hospital.

The New Town Hospital, Antwerp.—The fact of this having been the first hospital to which the principle of circular wards was adopted on an important scale would alone render it worthy of an extended notice. But, beyond this it is in itself an example of a well-thought-out and excellently arranged hospital, and is of interest quite apart from the peculiar form of its wards. The original conception of the circular ward design was due to M. Baeckelmans, architect, of Antwerp, but owing to disagreements between the local authorities in Antwerp and the "Conseil Général d'Hygiène Publique," that gentleman refused to carry out the work, which was then entrusted to two of his pupils, MM. Bilmeyer and Van Riel. It is not necessary here to enter into the details of the

criticisms made on the plans by the central authority or to follow the correspondence between that body and the local authority ; for those interested in the matter, the gist of the discussion will be found in Mouat and Snell's "Hospital Construction and Management." The site, an irregular shaped pentagon, is bounded on all four sides by streets. The ward pavilions are eight in number and are two storeys in height. They are connected together, and with the various administrative offices except the laundry, by corridors on the ground floor and by the flat roof over the corridors on the first floor. Each ward pavilion consists of three parts—(1) an entrance block containing three separation wards, the main staircase, a secondary staircase leading to the roof, a lift, and a room for utensils in which are two shafts (one for poultices, dressings, &c., and the other for dirty linen), both of which are carried down to the subway in the basement ; (2) the ward block ; and (3) the block in which are the water-closets, "tisanerie," or ward-kitchen, bath-room and lavatory. The connection between the main wards and these two subsidiary blocks is a covered bridge or passage, only 8 ft. 6 in. high, the space between the roof of the lower bridge and the floor of the upper bridge being entirely open. These bridges are provided with windows on each side. They are worthy of special note, as evidencing the care with which the wards are cut off not only from the water-closets, &c., but also from the staircase and isolation wards—points which are not usually so well considered abroad as they are in this country. The ward is a circle of 61 ft. 6 in. diameter, with an average height of 17 ft., and contains twenty beds. In the centre is an octagonal glazed enclosure forming a sort of combined sitting-room and medicine-room for the head nurse. The system of warming and ventilating is designed upon a combination of the propulsion and extraction systems, the fresh air being forced in by means of a fan worked by steam, and the vitiated air being drawn out by a heated upcast shaft in the centre of each pavilion. An arrangement is made by which, in case of a breakdown in the engine or other cause, the extraction system can do the whole work both of supply and exhaust ; and in any case the entering fresh air can be warmed by passing over steam coils on its way to the wards. Besides the eight ward pavilions, the buildings comprise the main administrative block containing the offices, dispensary, residences for staff, &c., the chapel, kitchen block, with servants' dormitories, nurse's house, operation room, mortuary, bath-house and laundry. The bath-house is a very complete little building

containing several kinds of medical baths besides ordinary baths.

Foreign Hospital.—Class I, Sub-class ID.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
BELGIUM. Antwerp, Civil Hospital*	368	9'00	149'00	17'00	2,525'00	28'35	1,126'00

* Figures from Mouat and Snell.

Published plans :—Antwerp : Mouat and Snell.

Sub-class IE.—HOSPITALS HAVING BOTH CIRCULAR AND RECTANGULAR WARDS.

Great Northern Central Hospital, London.—This hospital was erected in 1887, and was opened for patients in 1888. The buildings at present completed comprise roughly a little more than half the total accommodation. The plan shows the complete hospital. The building facing the Holloway Road will contain the residences for the medical staff and the matron, the board room and offices, rooms for twenty paying patients, and part of the sleeping accommodation for nurses. Joined to the front building by a corridor is a block which is divided into two parts by the cross corridor connecting the ward blocks. The front portion contains the secretary's office (temporary) and store-rooms, surgery, medical officer's sitting-room, and entrance for patients (at present the main entrance), two floors of bedrooms for staff, the kitchen offices on the top floor with servants' bedrooms on a mezzanine below; the back part contains in the basement the linen rooms (one of which is temporarily used as porter's sitting-room), nurses' dining-room and sitting-room on the ground floor (the latter now used as board room), and the operation room with surgery and ante-rooms on the second floor. The main staircase and the lift for patients is also in the back portion. The ward blocks are planned to the north-west and south-east of this central block, the portion on the south-east side being the rectangular block, that on the north-west the circular block. At present only the rectangular block has been erected. This block is of three storeys in height, with an open basement storey which lifts the ground-floor ward some 8 ft. or 9 ft. above the ground. The main object of adopting this arrangement was to lift the windows of the lowest ward of the circular block well up above the influence of the

adjoining houses. The great advantage is in addition gained of raising the wards well above the ground air, and of obtaining a free current of air from side to side underneath the ward. The wards are three in number. Each is 88 ft. long, by 29 ft. wide, and accommodates twenty beds. The floor space, wall space, and cubic space per bed will be in the circular wards exactly the same as in the rectangular, thus affording an accurate means of comparison. At the entrance to each ward is a duty-room and separation ward with cupboards for linen, clothes, and food, and water-closet and sink for the small ward. There is also a balcony to each floor, with door into the corridor. The bath-room, water-closets, and sink-room are placed in a projecting wing at the extreme end of the ward, and connected to the latter by a covered bridge 7 ft. high. The out-patient department* is a separate one-storey building, and so is the mortuary.

Liverpool Royal Infirmary.—This hospital was erected in 1888-9. The plan shows six ward pavilions, four of which are rectangular, the remaining two being circular. The front block is devoted to administration purposes. The building at the extreme north corner of the site is the home for nurses—an old building. The ward pavilion nearest to the nursing home has no basement. The central pavilion is occupied in the basement partly by stores, and partly by a large recreation hall with retiring room, &c. in connection. In the basement of the end block are the chapel, and various workshops and stores. The basement of the circular ward block adjoining the last contains porters' bedrooms. The central block between the two circular blocks is devoted to the out-patient department, and the basement of the second circular block contains coals, stores, and ambulance house and stable. Following the same order on the ground floor, the first rectangular block has a general ward for fourteen beds, separate rooms for five paying patients, three rooms for sick nurses, bath-room for the latter, vapour bath for paying patients, ward scullery, sister's room, and store for patients' clothes. The water-closet arrangements are built out at the end of the ward in very much the same way as at St. Thomas's. The central pavilion has a general ward of thirty beds, scullery and sisters' rooms, day-room, separation ward for two beds, store for clothes, and two lifts. The end ward pavilion has a ward of fourteen beds, sister's room, scullery, three small operation wards of one bed each, doctor's room, waiting-room, and store for patients' clothes. The

* *Vide* Section on Out-patient Departments, p. 87.

circular pavilion adjoining the last has a general ward for eighteen beds, with the stores arranged in the centre around a circular block of flues, sister's room, scullery, separation ward for two beds, doctor's room and clothes store. The central pavilion is arranged in a similar way to the corresponding one on the north-east side of the corridor, and the second circular pavilion is similar to the first. The operation theatre, with its four ante-rooms for chloroforming, instruments, &c., is built out from the corridor between the central pavilion and the north-west circular pavilion. Two detached buildings on the north-west side of the site are respectively the mortuary and the laundry.

British Hospitals.—Class I, Sub-class IE.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
Great Northern Central, London*	150	ft. 8'50	ft. 127'60	ft. 13'50	ft. 1,722'80	ft. 31'08	ft. 308'26
Royal Infirmary Liverpool— Circular wards .. } Rectangular wards }	292	{ 8'50 8'50 }	{ 131'98 120'00 }	15'00	{ 1,979'70 1,800'00 }	†30'00	—

* When completed.

† Omitting windows looking on to balcony at end of ward.

*Sub-class IF.—HOSPITALS WITH DETACHED OR ISOLATED
PAVILIONS.*

Type : St. Denis Hospital, near Paris. See page 156.

The Barrack-Lazareth, Moabit, Berlin.—This hospital was constructed by the Municipality of Berlin in 1872, as an epidemic hospital, but since 1875 it has been used for cases of almost every conceivable disease, including infectious fevers, but excluding surgical cases requiring important operations. The buildings throughout are of a temporary nature, the walls of the wards being formed of wooden framework filled in with stone somewhat in the fashion of English "half timberwork," and lined on the inside with boards grooved together and painted; and the roof consisting of a double layer of planks grooved together, painted on the inside, and covered externally with asphalt. The whole structure is set upon a layer of concrete about 1 ft. 6 in. thick, laid on the surface of the ground. All of the barracks, including also the kitchen and washhouse, are warmed by steam-pipes from a central boiler. The plan of a barrack

is exceedingly simple. It consists of a ward for twenty-eight patients, a day-room, duty-room, nurse's room, lumber-room, bath-room and water-closet. The latter, and a sink-room, open directly into the ward. The exact value of the mode of construction adopted in this hospital cannot be gauged until some years have passed, and the cost of maintenance and of renewal, and also the probable duration of the fabric, can be estimated with tolerable accuracy.

Cantonal Hospital, Aarau, Switzerland.—This is an excellent example of a modern Swiss hospital on a moderate scale. It consists of fifteen detached buildings, ten of which are devoted to wards. Of the remaining five, one is the main administration building, and contains the residences of the medical and nursing staff, servants' quarters, and the offices of management, and in two wings, one at each end of the building, wards for paying patients. Two ward blocks are devoted to ordinary medical and surgical cases, and contain each two wards for fourteen beds each, four wards for two beds each, a day-room and the usual offices. Attached to each ward is a store-room for patients' clothes, and at the end of each ward is a lobby with steps leading down into the garden. Two blocks similar to the last, but smaller and having no day-rooms, are devoted to diseases of the skin and to syphilis. Both the above are three storeys in height. Two blocks similar to the last-mentioned, but two storeys in height, are devoted to infectious cases. A children's block, one storey in height, contains two wards for fourteen beds each, two for one bed each, a play-room, a school-room, nurses' rooms, and the usual offices. In a remote corner of the site are two small blocks, one storey in height, for small-pox. The remaining buildings are boiler-house, kitchen and laundry, mortuary, bath-house, and the midwives' and midwifery institution.

Friedrichshain Hospital, Berlin.—This hospital was opened for the reception of patients in 1874, and may be said to represent the views of most of the great Prussian surgeons, including Drs. Esmarch and Esse. It consists of a group of isolated buildings, occupying a very spacious site and having no covered ways or corridors of communication. The ward pavilions are placed with their longer axes north and south, and are twelve in number. Four pavilions are devoted to surgical cases, and are one storey in height; six pavilions, two storeys in height, are devoted to medical cases, and the remaining two, also of two storeys, are for cases of infectious diseases. Midway between the surgical pavilions is the operation

room, with its offices. The wards in the medical and surgical pavilions are similar in size, and practically identical in the arrangement of the offices. Each ward contains twenty-eight beds arranged in pairs or "coupled," the end beds being single and placed in the corners of the ward. At one end of the ward is a day-room with a large covered balcony opening out of it. The closets and bathrooms occupy projecting wings on each side of the end of the ward, but are not separated from the latter by any intervening lobby. At the other or entrance end of each surgical pavilion are a small operation room, two small separation wards for one bed each, the duty-room and nurse's room. In the medical pavilions, instead of an operation room and two single-bed wards, there are two separation wards for two beds each. In a basement floor, under the part occupied by the wards and offices just mentioned, there is a receiving ward in which is a fixed bath, and also three living-rooms for attendants; and on an upper floor of this same part are two rooms for an assistant surgeon. At the other end of the building in the basement is the furnace-room with the stoker's room adjoining. The basement under the large ward is occupied by the heating and ventilating channels. The wards are heated by hot water by means of coils, which stand along the longer axis of the ward. Underneath the floor is a channel running the whole length of the building, in which are a number of hot-water pipes. The smaller rooms are heated by means of shafts from this channel, and warm air is also admitted to the wards through the casing which encloses the vertical coils. Fresh air is carried to the heating duct by an underground shaft opening into a lower shaft standing just above the ground between each pair of pavilions. The vitiated air is drawn out at or near the floor level behind each pair of beds by way of gratings, which communicate with shafts leading to a central extraction-shaft built round the iron flue from the boiler furnace. In addition to the hot-water coils, each large ward is provided with two open fire-places. The windows are provided with folding casements above which are fanlights, and a ventilating lantern, worked from a gallery provided for the purpose, runs along the whole length of the ridge of the roof. The floors of the wards are of tiles.

The Johns Hopkins Hospital, Baltimore, U.S.A.—Seldom if ever has a hospital been started on its career of usefulness with such deliberate care, such wise forethought, such self-sacrificing search after the best way, as have been devoted to the institution now to be described. In the letter of the founder, the late Johns Hopkins,

to the trustees whom he had charged with the carrying into effect of his wishes, he says, "It is my wish that the plan . . . shall provide for a hospital which shall, in construction and arrangement, compare favourably with any other institution of like character in the country or in Europe." In setting forth such an ideal the founder was in effect telling his trustees to profit by the widest possible range of experience open to them, so that the accumulated knowledge of the world should be brought to bear upon the new hospital. The letter quoted above is dated 10th March, 1873. The trustees set about their task at once, and on 7th May, 1889, that is more than sixteen years after, the new hospital was opened. The years were spent by the trustees and by their responsible advisers, first in obtaining from every available source information as to existing hospitals, and suggestions and advice as to their own mode of proceeding. And when, after much thought, the plans were finally decided upon, every step in the construction was carefully weighed, and every precaution that could possibly be taken to ensure perfection was unstintingly adopted. To give two instances:—all walls were allowed to stand for at least two seasons before being plastered, in order to permit of thorough settlement and to prevent the risk of cracking of the plastering as much as possible; and the wood for the floor was first soaked for six months in water and then dried for several years before it was prepared for use. The same minute and painstaking care was devoted to every detail of the building.

A reference to the plan will show that, so far as it is completed, the hospital consists of sixteen buildings, seven of which are ward blocks. In addition to these the complete scheme provides for five additional ward blocks on the south side of the site opposite to the five existing ward blocks. Three of the buildings—namely, the pathological building, the stable, and the laundry—are completely isolated; all the remainder are connected together by a covered corridor, which is on the level of the ground floor of the administration buildings, and the basement of the ward pavilions. The main administration building faces the front entrance, and is four storeys in height in addition to a basement. The latter, which is above the ground for about half its height, contains the hot-water coils for heating the building. On the ground floor are the offices with the board-room, library, superintendent's room, &c. Adjoining the office is a room containing the central telephone switch, by means of which communication can

be had between any two buildings of the hospital. On this floor also are two examining-rooms and a waiting-room for patients. The water-closets and lavatories are placed in an annexe beyond the main staircase. On the first floor are the residential quarters for the general superintendent and the resident medical officers, and on the second floor similar rooms for resident students. On the first floor the staircase communicates with the flat roof over the connecting corridor at the ward level. Behind the administration building is a block called the apothecary's building. Here on the ground floor is the pharmacy with the apothecary's rooms, and a large dining-room for officers, with pantry. On the floors above are the sleeping quarters for female servants. The small building, at the junction of the corridors leading from the administration block and the north pay ward, is the bath-house. Here, in the basement floor are the ordinary and needle baths, and on the ground floor sulphur and mercurial baths, and Turkish and Russian baths with dressing-rooms.

The building on the extreme north of the corridor from the administration block is the kitchen building. This building contains a basement and three floors. In the basement are store-rooms and larders. On the ground floor is the kitchen, 70 ft. long by about 30 ft. wide. The range stands in the centre of the floor, and is provided with a hood which conducts the fumes of cooking into the central chimney. Adjoining the kitchen is the scullery, out of which are two cold rooms. The construction of these rooms is peculiar. On the brick walls, first a layer of thick paper is placed, and then $1\frac{1}{2}$ -in. battens covered by a $\frac{7}{8}$ -in. lining of poplar boards. Over this is another layer of paper, another layer of battens, and another layer of $\frac{7}{8}$ -in. poplar sheathing, thus giving two spaces $1\frac{1}{2}$ in. in width to prevent the conduction of heat. In the smaller of the two, a lining of galvanised iron is laid over the inner poplar sheathing. The other rooms on this floor are a store-room and a dining-room. On the first floor are rooms for the cook and assistant cook, housekeeper's rooms, and a series of four dining-rooms for the servants. The two buildings which flank the main administration block at either end are intended for the reception of paying patients. In each the wards are arranged off a central corridor running from end to end of the building. On each floor there is accommodation for fifteen patients with a "tea kitchen" and linen closet. The water-closets, bath-rooms and lavatories are situated in an annexe at the back.

It will be noted, that although many of the sanitary offices are placed in projecting buildings, there is no attempt at disconnecting corridors between them and the wards, the reason being that reliance is placed upon the action of the extraction-shafts to prevent the passage of air from the closets to the wards or corridors. Proceeding eastwards along the corridor leading to the wards, the first block is the octagon ward. The reason for adopting this form is stated to be, that in carrying out the corresponding buildings on the south side of the site, the ordinary rectangular ward would have come too near the Nurses' Home. This block, unlike the other ward blocks, has two storeys of wards. At the point where the corridor, or rather the open way on the roof over the corridor, crosses the block is an octagonal hall. To the north of this is a building containing the staircase to the upper floor, two pay wards of two beds each, a dining-room, a store for patients' clothing, a linen store, a kitchen and a store-room. There are also two lifts for food, one going to the floor above, and a lift for coals and soiled linen. On the south side of the hall is the passage leading to the octagon ward, on one side of which are the lavatory and water-closets for patients, and on the other, bath-room, nurses' closet, and drying closet. The octagon ward contains twenty-four beds, and is 57 ft. 8 in. wide: at the south side is a sun-room, which in form is a semi-octagon. The beds are arranged in pairs against the piers between the windows, except those in the angles which have a window on each side.

The heating is effected by means of hot water supplied from a boiler in the kitchen building, from which a 26-in. main passes along the pipe-tunnel under the corridor. From this main the several branches are taken to supply the wards and other rooms. In the basement under the ward floors sixteen coils are placed, each in a brick chamber with an iron door which is readily removable for cleaning. Fresh air is admitted through openings in the exterior walls of the basement and comes from over the green lawn which surrounds the wards. These openings are protected by wire netting, and communicate with a galvanised iron flue which passes downwards to open in the chamber beneath the heating coil, and also upwards directly to the fresh-air register in the ward. By means of a valve in the external opening, which is worked from the ward above, the incoming fresh air can be entirely passed through the heating coil, or passed into the ward without being heated, or directed partly upwards and partly down-

wards so as to produce a mixture of any desired temperature. The method of extracting foul air is as follows:—Rising through the centre of the ward is an octagonal brick chimney 8 ft. in diameter internally, with walls 2 ft. 6 in. thick. Upon the face of this chimney are two openings from the ward, one near the floor, the other near the ceiling; those in the lower ward open directly into the central shaft. Within this brick chimney is set a boiler-iron tube, 5 ft. 9 in. in diameter, resting on a projecting iron base built into the walls, and this tube extends from the floor of the lower ward to above the ceiling of the upper one. Into the space between this iron flue and the outer chimney the openings from the upper ward enter. Just above the top of the iron flue is placed a ring of steam-pipe to act as an accelerating coil. Through the centre of the chimney rises a cast-iron pipe, which is intended to serve as a smoke flue for open fireplaces, to be placed in the wards if found to be desirable.

The common wards are arranged, so far as the necessary offices go, much on the same plan as the octagon ward. In the basement under the pay wards are three clinical laboratories and a room for the director. The heating is arranged upon the same method as that of the octagon ward, but the ventilation is different. Two systems of extraction are provided. The first consists of a series of circular openings in the floor of the ward, one beneath the foot of each bed. These openings communicate with a galvanised iron tube 12 in. in diameter, which passes obliquely on the ceiling of the basement to enter the lower foul air duct, which runs longitudinally beneath the ward floor to enter the ventilating chimney. The upper system consists of six openings in the centre of the ceiling of the ward, placed 13 ft. apart and each 2 ft. square. These open into a duct which runs above the ceiling of the ward, and enters the same ventilating chimney. In the main ventilating chimney, just above the point where the upper foul air duct enters, is placed a coil of steam-pipe. In cold weather only, the downward ventilation is used, as this tends to save heat; but when the ward becomes overheated, or it is desired for any reason to pass a great quantity of air through it, the ceiling registers are also opened. In addition to these means for producing and regulating air-currents, the common ward nearest the octagon is provided with a propelling fan placed in the basement at the south end. From the fan, which is worked by steam power, and is 4 ft. in diameter, a duct is led from which a branch is given off,

which enters each coil chamber at the floor and turns upward for a short distance.

The isolating ward block contains a series of rooms arranged on each side of a central corridor running the whole length of the building, and freely open to the air at each end. The walls of the corridors rise through the building to above the roof, and on them is placed a continuous lantern with movable glass louvres. The side walls of the corridor are practically double, and each room has double doors between it and the corridor. Each room is provided with an open fireplace and has also a similar arrangement to that adopted in the large wards for the supply of fresh warmed air. In each room is a small closet constructed in the thickness of the double corridor walls, in which is a commode containing a chamber utensil which can be removed through an opening in the wall without the necessity of entering the patient's room for the purpose. The closet is lined with galvanised iron and has a separate exit flue, in which is a steam coil. The door of the closet does not quite reach the floor, and the exit of foul air from the room takes place mainly through the closet and up its special flue. There is no common water-closet or bath-room in the building, and no risk of air passing from one room into another by way of the corridor. In three of the rooms the incoming fresh air, instead of passing through a register, enters through the floor, which, for a distance of 7 ft. from the outer wall, is perforated with $\frac{1}{4}$ -in. holes, giving over 94 sq. ft. of floor having fifty holes to the square foot. The object of this arrangement is to supply a large amount of air—about four cubic feet per second—to each inmate, and to have this air pass constantly upwards so that no part of it shall be re-breathed or come a second time in contact with the patient, thus placing him in a condition of being out of doors in a very gentle current of air.

The Nursing Home contains, in addition to the ordinary accommodation for nurses, a training school, a kitchen, a lecture-room, and a large library. The dispensary, or out-patient department as it would be called in England, contains a series of consulting-rooms arranged on two sides of a large waiting-hall, the other sides being occupied respectively by the entrance and the pharmacy with bath-rooms and water-closets on either side. Adjoining the dispensary is the amphitheatre building, in which is a large operation theatre, with seating capacity for 280 persons, a special operation room, an etherising room, surgeon's room, special ward

for three beds, and accident reception-room containing two beds. Between the two wards is a nurse's room. The pathological building is two floors in height besides the basement. In the basement are the heating apparatus, rooms for preparing gelatine cultures, workshops, and cages for keeping animals. On the ground floor are the mortuary, post-mortem theatre, and rooms for private research and bacteriological work. On the upper floor are the director's laboratory and laboratories for pathological histology and experimental pathology, a pathological museum and a photograph room. The laundry building contains separate washhouses and ironing-rooms for patients' and officers' clothes, a disinfecting apparatus, and hair-carding and bed-making rooms.

The foregoing is a comparatively brief description of this most interesting hospital, and has been compiled from the elaborate and complete account of the buildings published by the Johns Hopkins trustees.

The Municipal Hospital, St. Denis, near Paris.—This is an example of the system of construction invented by M. Tollet, an eminent engineer, whose attention was first drawn to the subject of ventilation during his period of service with the army. The conditions under which the soldiers, more particularly the sick, were housed in barracks were almost uniformly bad, and at variance with all the best known laws of health. The main principles advocated by M. Tollet are—(1) that hospitals should be built on the outskirts of towns, with ample area of site; (2) that the wards should be in one-storey buildings only; (3) that the wards for contagious diseases should be in separate buildings; (4) that ample floor and cubic space should be provided in the wards (104 sq. ft. and 2,202 c. ft.); and (5) that the vertical section of the wards should take the form of a pointed arch rather than the ordinary rectangular form, in order the better to promote efficient natural ventilation. It will be seen that the last is the only one of M. Tollet's principles which can lay claim to originality. It is considered by the inventor that the pointed arch form promotes ventilation in a way that no other form does or can. Wards arranged upon this system are usually about 26 ft. high, and the walls rise vertically from the floor to a height of about 8 ft., above which they take the form of a Gothic or pointed arch, the apex being some 26 ft. above the floor. The idea is that the curved form of the walls induces an upward current, and thus helps the discharge of vitiated air at the apex. However this may be, and, in the

absence of any definite experimental results, it is impossible to form a judgment on the question, the great care and thought bestowed by M. Tollet on all the details of construction and arrangement have to a very large extent revolutionised hospital construction in France. The Municipal Hospital at St. Denis, though not constructed under the immediate supervision of M. Tollet, is nevertheless a very favourable example of his system, and reflects great credit upon the architect, M. Laynaud.

The buildings are arranged in three parallel lines and are all detached. The two blocks on either side of the entrance are devoted to administrative purposes, one containing the board-room, offices, and kitchen department, the other containing the residences for staff and the dispensary. To east and west of these two buildings are two blocks of one storey in height, containing wards for aged men and women respectively. These form the "Hospice." The line of buildings to the north of those described comprises five separate blocks. These are all one storey in height. The three central blocks are for surgical patients and the two end blocks are for medical patients. The surgical blocks each contain a general ward for sixteen beds, at one end of which is a day-room, nurses' room, and ward scullery, and at the other end are a large surgeon's room (also used as a separation ward), bath-room, and bedroom for ward attendant. Two water-closets are placed in a small wing with a lobby provided with through-ventilation. On the south side is a large balcony the whole length of the ward. The medical blocks are planned much in the same way, except that each block contains two general wards, and that to each block is attached a bath-house containing a medicated bath, vapour and douche bath, and two ordinary baths with dressing-rooms. The ward blocks are raised upon brick piers some feet above the surrounding ground, and the space underneath, about 7 ft. high, is entirely open. The wards are warmed partly by hot air supplied by calorifers in the basement, and partly by stoves placed in the centre of each ward. The remaining buildings consist of the laundry, two small blocks for the isolation of infectious disease, a chapel, and a mortuary.

The New General Hospital at Hamburg, Eppendorf.—

This, one of the most recently erected hospitals in Europe, is, perhaps, the most remarkable example of the system of isolated pavilions to be seen. It was begun in 1885 and completed in 1889. The site appropriated to the hospital covers forty five acres, the

whole estate being 137 acres in extent. The buildings are eighty-two in number, ten of which are of a temporary nature, and were erected to meet the demands of an epidemic. The remaining seventy-two are substantially built of brick, and are arranged as follows: At the centre of the principal frontage to the Martinstrasse is the main administration building (No. 1), having at a short distance from it the governor's house (No. 67). Behind the main administration block the various pavilions are ranged, mostly in seven parallel rows, the men's side being to the east and the women's side to the west of a line drawn at right angles to the centre of the front block. In the centre of the first row is the operation house (22). On the male side are: (11) pavilion for cases after operation; (12, 13, and 14) one-storey surgical pavilions; and (15) small isolation pavilion. On the female side are: (2) a pavilion for cases after operation; (3 and 4) one-storey surgical pavilions; and (5) small isolation pavilion. In the second row are the following:—Male side: (16) two-storey pavilion for "boarders" (*i.e.* paying patients); (17) one-storey pavilion for eye cases; (18, 19, and 20) one-storey surgical pavilions; (21) large isolation pavilion. On the female side are: (6) two-storey pavilion for "boarders"; (7 and 8) one-storey surgical pavilion; (9) two-storey pavilion for eye cases; (10) small isolation pavilion. In the third row are: male side, (36) two-storey pavilion for "boarders"; (37, 38, 39, and 40) one-storey medical pavilions; (41) small isolation pavilion;—on the female side: (23) two-storey pavilion for "boarders"; (24) two-storey pavilion for children; (25 and 26) one-storey medical pavilions. In the centre of the fourth row is (50) the bath-house. On the male side are (42) a pavilion for the admission of cases; and (43, 44, and 45) one-storey medical pavilions;—on the female side are: (27) a pavilion for the admission of cases; and (28, 29, 30, and 31) one-storey medical pavilions. In the fifth row on the male side are two small (47) and large (48 and 49) isolation pavilions, and on the female side three small (32, 33, and 34), and one large (35) isolation pavilions. The sixth row comprises the "epidemic" department, and in each case consists of four pavilions, *viz.* a large isolation pavilion (55, male, and 51, female); a one-storey sick pavilion (56, male, and 52, female); and two small isolation pavilions (57, 58, male, and 53, 54, female). To the east of the male side of this row is the disinfection house (71). A sixth row of eight buildings, with two small blocks beyond, are the provisional or temporary buildings, erected to meet the pressure of an epidemic of cholera in 1884-5

(72 to 81). Near the western boundary of the site, and level with the fourth row, is a building (46) for furious lunatics, and to the north of this is the mortuary building. At the extreme (south) corner of the site is the medical superintendent's residence; to the north of this is a group of buildings, comprising the domestic offices, and being (60) kitchen offices; (61) laundry; (62) boiler-house; (63 and 64) steward's offices and stores; (65) the ice-house; (68, 69, and 70) officials' quarters.

The whole of these buildings are entirely detached, there being no covered communication of any kind. The total number of patients accommodated, including the 126 beds in the temporary huts, is 1,500. The large ward pavilions are, as has been noted, one storey in height. They are but slightly raised above the ground, and, except at one end, have no basements.

Each pavilion is arranged in the following manner: On each side of the entrance corridor are two rooms—four in all, three being isolation wards for one bed each, and the fourth an attendant's room with two beds. Between these rooms and the large ward is a corridor the whole width of the ward, in which is a metal shoot for foul linen to a room in the basement. The large ward contains thirty beds, arranged without regard to the position of the windows, and placed very close together, the linear space allotted to each bed being only 4·88 ft., and the floor area (reckoning the open spaces in the centre and the two ends) being about 78·81 ft. The cubic space per bed, 1,280·66 ft., which is certainly not excessive, is obtained by raising the roof to the height of 16 ft. 3 in. The proportions of these wards certainly do not comply with the usually accepted conditions of area and cubic space in due relation to each other. At the further end of the ward is a day-room, with doors opening out into the garden. On one side of the day-room are the ward scullery and the bath-room, and on the other is a large room opening into the ward and containing three water-closets. The partitions enclosing the water-closets do not go up to the ceiling or down to the floor; there being no ventilated lobby between the room containing these offices and the ward, it follows that they are in free atmospheric communication with the latter. The floors, with the exception of the day-room and the single-bed wards, are laid with "terrazzo"; the walls have a painted cement dado 5 ft. 6 in. high, above which they are plastered and coloured. The outer walls are of brick, and the roof, which is almost flat, is "wood cement," containing a layer of spar 2 in. thick. This form of roof

is said to be an effectual protection against extremes of heat and cold.

The wards are warmed in the following manner :—Immediately under the floor are a series of channels about 2 ft. 6 in. wide, the division walls of which support cement slabs, upon which the terrazzo floor of the ward is laid. In each of these channels runs a steam-pipe supported on iron rails. The steam is supplied from a boiler placed under one of the isolation wards, each pavilion having its own independent boiler. In each large ward are two steam radiators, and in each isolation ward is a smaller apparatus of the same kind ; these are all connected with fresh-air ducts from the outside. The bath-rooms are warmed in a similar way, but provision is made for a higher temperature than in the wards. The ventilation of the wards is provided for by the windows, and by a ridge ventilator on the roof. The system of floor-heating here adopted is professedly based upon the ancient Roman system of heating baths by means of flues formed under the floor, and its advocates claim for it the following advantages—(1) that it renders possible the use of an impervious material for the floor surface ; (2) that the greatest warmth is at the part needed, that is nearest the feet ; and (3) that the air, being constantly circulating, the system materially assists ventilation. The isolation pavilions are arranged much in the same way as the large ward pavilions, and need no special description. The pavilions for “boarders” consist of a series of rooms leading out of a corridor, with the staircase in the centre. The rooms are of varying sizes, some being intended for two beds, some for one bed only. The operation house is a two-storey building, having cellars underneath. There are two operation rooms, each with a large semi-octagonal bay, with windows forming each side. One of these is made smaller than the other by having an ante-room formed out of it. The other communicates directly with the instrument-room. There are on the same floor two waiting-rooms, a room for plaster of Paris, and a bandage store, and on the upper floor is a large room for the preparation of bandages and dressings. In the basement are rooms for the attendants, and a special bath-room intended for the surgeon’s use before operating. The bath-house contains on the ground floor a complete Roman bath, with frigidarium, lavarium, tepidarium, and sudatorium, electrical bath, bath for attendants, and doctor’s room ; and, on the upper floor, two sets of fixed baths—one for men, the other for women. The mortuary building contains at one end on the ground

floor a chapel, with priest's room, waiting-room for mourners, and a separate mortuary chamber. The rest of the floor is occupied by physiological and bacteriological departments, and the post-mortem room. In the basement are rooms for attendants, for the preservation of bodies, for storing coffins, &c. and for other purposes connected with the physiological department.

The Town Hospital at Urban, Berlin.—This hospital, which was completed on the 9th July, 1890, is situated in the south-east part of Berlin. The total accommodation provided is 600 beds, of which seventy-five are appropriated to children. The buildings comprise an administration block, eleven ward blocks, an operation-room block, boiler-house, attendants' block, porter's lodge, bath-house, and mortuary block. The site is surrounded on all four sides by streets, that on the east being the wide "Grimm Strasse." The ward pavilions have their longer axes due north and south. The front administration block contains the offices, a patients' reception-room, waiting-hall, and dispensary, residences for the officials and medical staff, and nurses' bedrooms. The two smaller ward blocks on either side of the administration block contain each on the ground-floor two wards for eight beds each, and two wards for one bed each, with a waiting-room, bath-room, tea kitchen (or ward scullery), and closet. The same arrangement is repeated on the first floor and on a floor above; the central portions are bedrooms for nurses. The pavilions Nos. 3 to 8 are two storeys high and each contains on each floor a general ward for thirty-two beds, two small wards for one bed each, a scullery, doctors' room, room for dirty linen in which is a water-closet, day-room, bath-room, and water-closets. The water-closets are in no case cut off from the wards by a ventilated lobby. Pavilions Nos. 9 and 10 are planned on the same lines as Nos. 1 and 2, but are larger. No. 11 is an isolation pavilion one storey high, having two wards for four beds each. The ward pavilions, although otherwise detached, are in direct communication with each other and with the mortuary by means of a subway communicating with each pavilion at the basement level. The operation-room block contains the operation theatre, waiting-rooms, a smaller operation room, doctor's room, and instrument-room. The projecting part of the operation theatre is planned in the form of half a sixteen-sided figure, and has seven windows. Within a short distance from the theatre door is a water-closet, but no attempt whatever has been made to disconnect it from the main building. The attendants'

block is two storeys in height, and contains the kitchen offices and stores, the laundry, and the quarters for servants. The bath-house contains, besides ordinary baths, a frigidarium, sudatorium, tepidarium, lavarium, and a Russian steam-bath. In the mortuary block is a post-mortem room, a chapel, and a dead-house. The whole hospital is heated from a central apparatus in the boiler-house, and is lighted throughout by electricity.

The University Hospital, Halle.—Of all the recently erected hospitals in Germany this is probably the most complete. As at Heidelberg, there is a large and important clinic, but the buildings are on a larger scale, and the design of the hospital is welded more into one uniform whole than at the former place. The buildings are sixteen in number, of which thirteen form the hospital proper, the other three being devoted entirely to educational purposes. All these buildings are entirely detached from each other, and form each a separate little hospital, each being, except for the kitchen and laundry, complete in itself. In the centre, immediately opposite the main entrance, is a large block with four wings. These together form the surgical department. The central block is two storeys in height above the basement, and contains the out-patient department, operation theatre, with several small wards for patients after or before operation, one large ward for twenty-four patients, and various rooms for doctors, &c. The wings are one storey in height, and are raised about 8 ft. above the ground upon an open vaulted basement, the central portion of which is left entirely open at the sides. The longer axis of these wards runs east and west, and along the south side of each is a verandah, about 10 ft. wide, entered by French casements from the ward, and having a flight of steps leading down to the garden. At the entrance from the corridor is a large vestibule, which is also the ward scullery. At the further end is a small nurses' room, a bath-room, a lavatory, and two water-closets. Separating these rooms is an ante-room, with stairs down to store-rooms in the basement. The wards each contain twenty-four beds, which are arranged in pairs between the windows. The walls of these pavilions are formed of wooden framing filled in with brickwork, and finished internally with boarding, painted and decorated. The surface of the floor is finished with terrazzo laid upon concrete. The wards are warmed by steam-coils supplied from the central boiler-house. Under ordinary circumstances, the ventilation is carried out solely by natural means, such as open windows and ventilators in the roof; but when it is found necessary by reason of extreme cold to close all the windows, the foul air can be extracted by way of an under-

ground shaft, which communicates with the flue from the boiler furnace. Fresh air is admitted to the wards by openings at the back of the steam-coils. The two buildings nearest the surgical wards on the south are the kitchen block and the boiler-house. The kitchen block is four storeys in height, and contains, in addition to the usual kitchen offices, the washhouse and laundry, and the quarters for the servants and attendants. To the south of the last two blocks is a large building with two wings, which is devoted to the treatment of diseases of women. It consists of a basement and two upper floors; in the basement are dining and reading rooms for students and stores; on the ground floor are rooms for the director and assistant medical officers, some small wards and a lecture-room; and on the upper floor are several wards of varying sizes, lying-in wards, rooms for the midwife, operation room, and lecture-room. Adjoining the last block to the south is the director's house. Northwards of the surgical department is a building devoted to the treatment of diseases of the eye and ear. The block is almost equally divided between the two departments, and contains, in addition to the accommodation for patients and the accessory offices, a lecture-room and an operation theatre common to both. The medical department consists of three separate buildings, a central block with two wings, and an isolated pavilion on each side. The central block, with its wings, is two storeys in height; the isolated pavilions are one storey only. In the basement of the central block are rooms for porters and other male servants. In the basement of the wings are wards for syphilitic patients, two in each wing, and padded rooms for lunatic patients, one in each wing. The ground floor of the central block contains the out-patient (medical) department, a large lecture-hall, and rooms for the director and staff. On the upper floor are small wards for children, rooms for resident staff, registrars' rooms, and library. In each wing there are on the ground floor one ward for twelve beds, one for three beds, and two for paying patients, one bed each, besides the usual offices. This arrangement is repeated on the upper floor. The isolated pavilions are similar, on a smaller scale, to the surgical pavilions, but are built of brick, plastered inside. The isolation pavilions are planned very much on the lines of the medical pavilions, except that one of them is arranged to accommodate both male and female patients, and has the ward offices placed in the centre between the wards. The remaining buildings consist of the chapel, physiological institute, pathological institute, and anatomical institute.

164 *Hospitals and Asylums of the World.—Hospitals.**Foreign Hospitals.—Class I, Sub-class 1F.*

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
AUSTRIA-HUNGARY.							
Buda-Pesth, Borough General Hospital	—	—	—	—	—	—	—
FRANCE.							
St. Denis, near Paris	*166	*8'28	*112'00	—	*2,457'00	*25'37	*1,686'00
New Hospital, Havre	300	—	—	—	—	—	—
Nancy, Communal Hospital ..	500	—	—	—	—	—	—
Marseilles, Lazaretto	—	—	—	—	—	—	—
Trompeloup, Gironde, Maria Theresa Hospital	—	—	—	—	—	—	—
Vichy Civil Hospital	—	—	—	—	—	—	—
GERMAN EMPIRE.							
*Friedrichshain, Berlin (Town Hospital)	600	6'91	108'00	—	{ 2,076'00 1 722'00 }	23'35	1,713'00
*Moabit, Berlin	700	6'16	69'00	—	864'00	11'18	1,144'00
*Tempelhof (Military), Berlin ..	504	6'50	93'00	—	1,273'00	22'50	1,309'00
Urban Hospital, Berlin	500	—	97'12	16'40	1,592'76	14'09	584'64
Hamburg, Eppendorf	1,500	4'88	78'81	16'25	1,260'66	27'00	1,366'86
*Halle University	496	{ 9'16 9'50 }	{ 135'00 140'00 }	—	{ 2,033'00 2,207'00 }	{ 16'50 26'00 }	{ 1,738'00 1,738'00 }
*Heidelberg—							
Surgical, one storey	382	6'41	94'00	—	1,638'00	12'50	1,071'00
Medical „ „		6'58	97'00	—	1,689'00	14'28	
Surgical, four storeys		8'16	137'00	—	2,050'00	—	
Medical „ „		7'16	129'00	—	1,909'00	—	
†Leipzig (Barrack Hospital) ..	350	6'48	133'33	—	2,333'33	—	—
St. Jacob's Hospital	—	—	—	—	—	—	—
Wiesbaden	234	—	—	—	—	—	—
RUSSIA.							
Alexander Hospital, St. Petersburg	—	—	—	—	—	—	—
SWITZERLAND.							
Berne, Insel Spital	—	—	—	—	—	—	—
Aarau New Hospital	329	† { 7'28 4'92 }	101'24	12'79	1,294'85	20'96	2,562'23
UNITED STATES.							
Baltimore, Johns Hopkins Hospital	\$380	7'50	106'75	16'56	1,768'75	21'42	481

* Figures quoted from Mouat and Snell.

† Figures approximate only.

‡ Coupled beds.

§ When completed; present total 220.

Published Plans:—Nancy: Morey (P.), "Le Nouvel Hôpital de Nancy." St. Denis: "L'Hygiène en France"; "Nouvelles Annales de la Construction," 1881. Vichy: "La Semaine des Constructions," 1876. Friedrichshain: Mouat and Snell; Gropius and Schnieden; "Das städtische Allgemeine Krankenhaus," L. Klagen. Moabit: Mouat and Snell. Tempelhof: *Ibid.* Halle: *Ibid.* Heidelberg: *Ibid.* Wiesbaden: "E. Plage Studien über Krankenhäuser."

Colonial Hospitals.—Class I, Sub-class 1F.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Singapore, Pauper Hospital	500	6'00	72'00	—	—	—	—
Malacca, Pauper and General Hospital	168	—	—	—	—	—	—



CHAPTER VII.

CLASS 2.—BLOCK HOSPITALS.

Sub-class 2A.—FOUR BLOCKS ARRANGED ROUND A COURTYARD, BUT NOT CONNECTED AT THE ANGLES.

Type: St. Bartholomew's.

St. Bartholomew's, London.—This large and important hospital is the oldest institution of the kind in London. It was founded in the year 1102 by Rahere, who is commonly said to have been minstrel to Henry I., but the authority for this statement does not seem to rest on any very solid basis. A priory of Black Canons was also founded by him in close proximity to the hospital, and their church yet remains, though in a mutilated condition, as St. Bartholomew-the-Great, Smithfield. The purpose of the hospital was defined as for "brethren and sisters, sick persons and pregnant women." A new charter of incorporation was granted by Henry VIII. to the mayor, commonalty, and citizens of London. The great fire of London, which extended to within a stone's throw of the hospital, whilst it spared the latter, seriously injured much of the hospital property. In 1730, the hospital, which had then fallen into bad repair, and which was in many respects insufficient and unsuited for its purpose, was rebuilt. A branch hospital, for the treatment of venereal patients by salivation, formerly existed in the Kingsland Road, and another branch in Kent Street, Southwark. The former, on whose portals the motto "Post voluptas misericordia" was displayed, was discontinued in 1764, and the premises let on lease. St. Bartholomew's forms one of the group of five royal hospitals. In one particular, St. Bartholomew's is probably unique. The buildings and the hospital grounds form in

themselves a whole parish, and include the Parish Church of St. Bartholomew-the-Less, which is the hospital chapel. The hospital proper consists of four large blocks, surrounding a large open square, three of which are ward blocks, the fourth being devoted to the offices, court-room, and treasurer's house. The ward blocks contain on each floor two double wards, each with a sister's room and ward scullery. The staircase divides the building into two equal parts. At the north-west corner of the site is a building containing a large out-patient waiting-hall, with consulting-rooms adjoining the "Abernethy" wards and the operation theatre. The north-eastern boundry of the site is formed by residences for the house physicians and surgeons, the residential college for students, and a nurses' house. At the eastern angle is the home for nurses, matron's house and house for clerk of works. The church is situated on the north-west side. At the south-west side is a range of buildings principally devoted to school purposes, with an outlying part of the out-patient department.

British Hospital.—Class 2, Sub-class 2A.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
St. Bartholomew's	676	ft. 6'00	ft. 104'25	ft. 14'58	ft. 1,222'82	ft. 14'00	ft. 310'11

Published plans : Oppert, Bristowe and Holmes.

Foreign Hospital.—Class 2, Sub-class 2A.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
GERMAN EMPIRE. Carlsruhe	—	ft. —	ft. —	ft. —	ft. —	ft. —	ft. —

Sub-class 2B.—TWO BLOCKS ARRANGED LIKE AN L AND CONNECTED TOGETHER.

Type : Royal South Hants Infirmary. See page 167.

General Hospital, Wolverhampton.—In this plan the L-form is modified by a projecting wing opposite the upright stroke of the L, but not so long. The longer wing is at the right-hand side, as if the L were reversed thus : J, and is formed, like that at South-

ampton, of a pavilion ward. The corresponding wing, on the other side, is mainly taken up by isolation wards, which are cut off from the rest of the building, and are entered from the courtyard. There is, however, a door of communication with the main block, for use if need be. The wards are interspersed with the rest of the hospital, and there is free communication, except as above, with the isolation wards throughout the building. The out-patient department is a separate building with a covered porch connecting it with the main block.

North Devon Infirmary, Barnstaple.—This is an example of a building erected in the early part of this century (1826), and enlarged on no less than four subsequent occasions. It would have been far better to have made a clean sweep of the whole and begun afresh, than to have added a bit here and a bit there, with the result that the building as it stands contains nearly every defect possible. The form of the building is the L shape of the type. In the basement are the kitchen offices, casualty-room, and surgery, two bedrooms for porters, and a chapel. On the ground floor are the principal entrance, committee room, house surgeon's rooms, matron's and head nurse's rooms, and two wards. The water-closets are placed about in various corners, with no attempt at disconnection. The first and second floors are principally occupied by wards of various sizes. On each floor is a servant's bedroom, which is absolutely without ventilation, and is lighted by means of a glazed partition which separates it from a nurse's bedroom adjoining. The operation room is in the centre of one wing, between two staircases, and is in direct communication with one of the wards. Between two of the larger wards is an ante-room, without either light or ventilation. In this ante-room is a sink, and in direct communication with it is a water-closet. There is no cross-ventilation worth the name in any of the wards, and the whole of the building is in the freest possible aerial communication. The out-patient department and the mortuary are placed in detached buildings.

Royal South Hants Infirmary, Southampton.—The typical form of the sub-class is well shown in this example, but the upper or long stroke of the L is, in this hospital, one large ward of the pavilion form. All the other wards are corridor wards, and thorough atmospheric communication exists. Four detached buildings are, respectively, an isolation block for infectious cases, a general laundry, a "foul" laundry, and a mortuary block.

Sheffield General Infirmary.—The plan of this hospital as it stood before the additions of 1884, the plan of which it has not been possible to obtain, consisted of a simple L-shaped building with wards from one extremity of the building to the other, all communicating with one another, either directly or by means of corridors, and with direct vertical communication by means of the staircases.

British Hospitals.—Class 2, Sub-class 2B.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Royal South Hants* Southampton ..	104	9'00	108'55	14'00	1,519'70	13'98	2,103'84
Sheffield, General	200	5'00	59'37	14'00	831'18	13'50	11,524'60
Wolverhampton	224	7'50	97'79	15'25	1,493'29	16'42	623'65
Barnstable	100	—	—	—	—	—	—

* These figures are approximate only.

† Approximate.

Published plans:—Sheffield: Oppert, Bristowe and Holmes.

*Sub-class 2C.—THREE BLOCKS ARRANGED AS A
RECTANGULAR U.*

Type: London Hospital. See page 170.

Charing Cross Hospital.—This hospital was founded, in the year 1818, by Dr. Benjamin Golding, M.D., under the name of the West London Infirmary, which gave place to the present name in the year 1827. It is, therefore, one of the youngest, as well as one of the smallest, of the clinical hospitals of London. The plan of the original building was a single straight block (Class 2, Sub-class 2F), but subsequent additions have so altered the form of the buildings that the only category to which the plan can now be referred is that of sub-class 2C, or the rectangular U. The site which is occupied by the hospital forms one side of a triangular "island" bounded by King William Street, Agar Street, and Chandos Street, the main entrance to the hospital being in Agar Street. About half the entire area of the triangle is taken up by the hospital buildings, while at the truncated apex, formed by the junction of Chandos and King William Streets, is the Westminster Ophthalmic Hospital. It is to be hoped that ultimately the whole of the land enclosed by the three streets named will be acquired by the authorities of the Charing Cross Hospital, and that the Ophthalmic Hospital will then become a department of the former institution. The site pre-

sents many obvious advantages for a general hospital ; it is in the centre of a very busy traffic, while sufficiently removed from the thick of the noise ; it is easily accessible from all parts of London ; and it is within a stone's throw of one of the great railway termini. The general form of the building above the ground floor is, as has been remarked, that of a rectangular U, with the exception that the left arm of the letter is shorter than the right, and that a building containing the main staircase and bath rooms projects out of the centre of the connecting-piece. The building forming the left or shorter arm is the nursing home. That forming the right arm is partly occupied by shops on the ground floor, partly by the out-patients' department, while above are wards and resident officers' rooms. The central portion, which faces Agar Street and forms one side of the triangle, contains administrative offices on the basement and ground floors, and wards above. These main wards contain twenty-two beds each, and are separated from each other by the ward kitchen and a lobby. The ward at the Chandos Street end opens into a ward for ten beds in Chandos Street. Practically, therefore, these three wards become one ward of fifty-four beds. The ten-bed ward just referred to is, in its turn, in direct communication with the passage which leads to a ward for five beds, and a staircase giving access to the wards at this part of the building. It is, therefore, clear that the whole of the wards are in free atmospheric communication with one another. The school buildings are entirely separate from the hospital, on the opposite side of Chandos Street. Communication between the hospital and the school is by a passage, constructed under the street. The post-mortem room is in the school buildings.

The Guest Hospital, Dudley.—The following account of the origin of this hospital is extracted from the "*Dudley Guardian*" for the 28th October, 1871: "It will be remembered that some fourteen or fifteen years ago,* the late Mr. Richard Smith, the then principal agent of the Earl of Dudley, recommended his lordship to provide an asylum for the poor limestone miners, with their families, who might from time to time be blinded or badly maimed while following their daily employment on his large and extensive estate. . . . Such a benevolent project, as our readers may be sure, was no sooner broached to his lordship than, entering fully into the philanthropic spirit displayed by Mr. Smith, he at once gave orders to have it carried into effect. Plans were prepared, the

* That is to say, about the year 1856.

works commenced, and rapidly proceeded with. The building consisted of twenty-four neat little cottages, fitted up with every comfort, forming the beautiful block of buildings known as the Blind Asylum, situated in the Tipton Road." Of the provision thus munificently made by Lord Dudley, those for whom it was intended declined to avail themselves, and the building remained tenantless until, about 1866, it occurred to the trustees of the will of Mr. Joseph Guest, who had left £20,000 to endow a hospital, that the building could readily be converted to the requirements of a general hospital. Accordingly, on the proposition being broached to Earl Dudley, he made over the buildings and land as a gift to the trustees, and took upon himself the cost of making the necessary alterations. The buildings thus altered to suit the needs of their new purpose were opened in 1871. The plan is in the form of the rectangular U, with one or two slight projections. The buildings, therefore, form three sides of a spacious quadrangle, the fourth side being entirely open. The main entrance is in the quadrangle, in the centre of the connecting-block, which faces west. The connecting or east block is cut in two on the ground floor by an arched gateway, above which is a clock tower. On the south side of the gateway are the domestic offices, kitchens, &c., on the ground floor, and the chapel and nurses' bedrooms above. On the north side the ground floor is occupied by a male surgical ward, which extends in height up to the roof; there is, therefore, an upper storey over a small part of this building only, which is devoted to bedrooms for nurses. The south wing contains on the ground floor the surgeon's residence, convalescent rooms, waiting-rooms, dispensary, and offices, and the upper-floor wards with their offices. The north wing is entirely devoted to wards. At the back, or eastwards of the centre building, is a detached laundry and a mortuary block.

London Hospital.—This, the largest of all the London hospitals, was established in 1740, under the title of the "London Infirmary," in four houses, with 136 beds, in Prescott Street, Goodman's Fields. The foundation-stone of the present buildings was laid in 1752, and the buildings were finished in December 1759. In the building thus completed provision was made for 130 beds, but for want of funds eleven wards remained unused. In 1807, after special efforts, the hospital was improved, and the number of beds raised to 187. Additions were again made in 1814 and 1831. In 1840 the east wing, containing seventy beds, was built. In 1864 the

west wing was commenced, and called, after the Princess of Wales, the "Alexandra wing," making an addition of seventy beds. Again, in 1866 and subsequently, many additions were made, including ophthalmic wards, children's ward, isolation wards, additional accommodation in the out-patient department, and laundry, and other much-needed improvements. In 1873 the needs of the hospital had become so urgent that a special appeal was set on foot, which resulted in the construction of the "Grocers' wing," so called in acknowledgment of a donation of £20,000 from the Grocers' Company. This building was opened by the Queen on the 7th March, 1876. This last addition raised the total number of beds to 790. The older part of the building is in the form of a rectangular U, or, more correctly, forms three sides of a quadrangle, with the front of the connecting block facing north. Wings have been added to the north-west (containing wards and house governor's residence), to the north-east (containing wards), and southwards again from the last (the Grocers' wing). The eastern arm has been continued southwards by the erection of the home for nurses, and a detached house for the chaplain has been built in the south part of the garden. The London Hospital Medical College forms a separate building on the western boundary.*

Newcastle-on-Tyne Royal Infirmary.—Originally built in 1754, this hospital was enlarged in 1802, 1830, and finally in 1852. As may be imagined, the plan is a somewhat complex one, and the wards vary very greatly in size and in form. The general plan of the building (excluding the large temporary ward) follows that of the type, except that the projecting wings are very much shorter in proportion, and that a narrow projection has been added on to the right-hand outer angle of the block, projecting both from the lower or main front and from the side. This building contains the chapel, governor's hall, residential apartments, and operation room on the ground floor, and wards above. The rest of the front block is occupied by wards of various sizes, all communicating with a corridor which runs the whole length of the building. These wards are lighted and ventilated on one side only. The right-hand, or west wing contains, on the ground floor, students' rooms, library, museum, and accident-room, and on the upper floor, bedrooms for staff. The east wing contains on each floor a large double ward, divided down the centre by a wall, with openings only at the ends,

* The facts embodied in the above description are taken from the annual report of the hospital.

These wards contain together forty-eight beds. A projecting wing at the south-west angle contains bath-room and ward scullery, and a similar wing on the opposite side contains a lavatory and a row of three water-closets, so arranged that to get to the third it is necessary to pass through the other two. The out-patient department forms the basement under the east wing, and the kitchen offices are in the basement of the projecting building at the north-west angle of the main block. In a separate one-storey building adjoining, but not communicating with the east wing, is the laundry. A range of one-storey buildings, detached from the last, contains Turkish baths, workshops, and stables, and the mortuary is a one-storey building on a level with the basement, and adjoining the south-east wing of the east ward. The temporary wards are placed in a one-storey building, projecting at right angles to the north or main front, and connected by a corridor to the first floor of the front building. They consist of two wards of twenty-five beds each, placed side by side, and divided by a partition 7 ft. 6 in. high, thus forming a double ward of fifty beds. Attached are nurses' bed- and sitting-rooms, ward scullery, bath-room, separation ward, lavatories, water-closets, &c.

University College Hospital.—This hospital originated in 1828 as the "University Dispensary," at No. 4 George Street, Euston Square. The importance of having a clinical hospital available for the students of what was then known as "London University," since called "University College," becoming apparent, it was determined to build one in close proximity to the college; and accordingly, in 1833, the first stone of the "North London Hospital" was laid by the Duke of Somerset. The new hospital was opened in November 1834. The south wing was completed in 1840, and the north wing in 1846. In 1867 additional accommodation for the staff was added by building an additional storey. Other additions have been made from time to time, the most notable of which is the provision of a complete set of medicinal baths. These baths, which were established mainly through the exertions of Dr. Tilbury Fox, are almost, if not quite, the only instance in England of the kind attached to a general hospital.* The plan of the hospital above the ground floor is a modification of that of the older part of the London Hospital. The main front, facing Gower Street, has a north-east aspect. The north-west

* The foregoing sketch of the history of this hospital is taken from *A History of the Hospital*, by Newton H. Nixon, secretary, London, Lewis, 1882.

wing, facing Grafton Street, is much longer than the south-east wing, which faces University Street. At the south-west side, instead of being open as is the London, the site is surrounded by the houses in Sussex Street. On the ground floor, more than half of the space behind the Gower Street front is covered with one-storey buildings, containing the out-patient department, theatre, and post-mortem room. Above, on the ward floors, the whole building communicates from end to end. The projecting block in the centre of the Gower Street front is occupied by rooms for residents, small wards, and ward sculleries. The nurses are housed at Nos. 24 and 25 University Street, adjoining.

British Hospitals.—Class 2, Sub-class 2C.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
London Hospital	790	*11'00	97'50	12'00	1,170'00	13'70	275'69
Charing Cross	—	7'50	104'28	—	—	—	—
University College	206	6'00	93'75	14'00	1,312'50	—	274'75
Newcastle	220	8'00	112'00	14'00	1,568'00	15'18	792'00
Dudley, Guest	75	8'00	82'58	*19'71	1,628'23	22'97	—

* Approximate.

Published plans :—London : Oppert, N., Bristowe and Holmes. Charing Cross : Oppert, Bristowe and Holmes. University College : Oppert.

Foreign Hospitals.—Class 2, Sub-class 2C.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
AUSTRIA-HUNGARY.							
Vienna, Rudolfstiftung	860	—	—	—	1,480'00	—	—
Trieste	912	—	—	—	—	—	—
FRANCE.							
Necker, Paris	442	—	91'84	17'05	1,565'87	—	—

Sub-class 2D.—THREE BLOCKS ARRANGED AS AN H.

Type : Norfolk and Norwich Hospital. See page 177.

Bedford General Infirmary.—This hospital, a block plan only of which has been obtainable, consists of a large main block in the H form, a laundry, a detached fever hospital with its own laundry, and

a detached dead-house. In the report by Dr. Bristowe and Mr. Holmes already referred to, it is said to be well adapted for the purposes for which it is used, viz. "the reception of patients, few of whom are very gravely affected, and the majority of whom are not confined to bed, and have sufficient opportunities for enjoying fresh air and exercise."

Bristol Royal Infirmary.—This hospital is one of the oldest of the provincial hospitals, having been erected in 1790. The plan of the first floor is in the **H** form, only with the central piece very wide in proportion to the sides and with a wing added on to the upper part of the left-hand stroke. The whole of the two upper floors is devoted to wards, with the exception of part of the central portion on the second floor, which contains the operation room, with two small wards and a consultation-room adjoining. The wards for the most part are of the corridor type, and the disconnection of the water-closets is in almost all cases imperfect. There are three staircases, one in the centre of the central block, and one in the centre of each wing. On the ground floor are three wards, a chapel, a board room and residents' rooms. In the basement and sub-basement are the various administration offices, including a laundry, out-patient department, and museum.

Chesterfield Hospital.—The plan of this hospital follows the **H** form on the ground and first floors only, the right-hand wing being only two storeys in height, whilst the left-hand wing is four storeys high. The two wings are connected by a transverse corridor, on one side of which is placed the operation room and surgeons' room, on the other side a small kitchen. The basement of the left-hand wing contains store-rooms and larders; the ground floor contains matron's sitting- and bedroom and stores, nurse's mess-room, and house surgeon's rooms; on the first floor are two general wards, a ward scullery, and special ward; and on the second floor are a small ward and bedrooms for the staff. The right-hand or east wing contains on the ground floor the out-patient department, convalescent ward, and board room, all south of the transverse corridor, and a mortuary and a laundry north of the same. On the first floor are a general ward for twenty beds, two small wards, and a nurse's room and ward scullery. The water-closets are in no case disconnected from the wards, and the position of the mortuary and laundry in relation to the wards is particularly bad.

Leicester Infirmary.—This hospital is in point of foundation still older than the Bristol Royal Infirmary, having been built in

1771. Considerable additions were made in 1861-2 at a cost of £17,000. The original building accommodated only sixty patients, but successive additions have brought the total up to 221. The plan follows the **H** form with both the upper strokes much longer than the lower ones, and the left-hand upper stroke longer than the right-hand one. The central part is, on the ground floor, devoted to officers' rooms, board room, &c. The two shorter wings contain wards. The greater part of the longer or left-hand wing contains the out-patient department, the part at the extreme end being fever wards which have a separate entrance from the outside. The shorter or right-hand wing is entirely taken up with wards. This wing is connected with the main building by a short length of corridor provided with cross-ventilation.

Lincoln Hospital.—The present building is modern, and dates from 1876, when it replaced a building of over a century old, and not only very ill-contrived for its purpose, but so bad as to be pronounced hopelessly unhealthy. The existing hospital is a very typical example of the sub-class. It has two wings joined together in the centre by a corridor, in the centre of which project on either side smaller wings. The central block contains, on the ground storey in the front, receiving and examination rooms, surgery, consulting-room, accident-room and rooms for the house surgeon; at the back, eye wards and operation room with ward adjoining. Part of this block is devoted to the laundry, and is approached only from the outside. The first floor contains rooms for the matron and housekeeper, day-rooms for nurses, linen-rooms, and the chapel. On the second floor is the nurses' and servants' accommodation, and on the top floor are children's wards with the usual ward offices. The kitchen offices are in the basement. To the east and west of the central block the corridor leads to the two ward pavilions which form the upright strokes of the **H**. Midway between the central block and each ward pavilion is a day-room for patients, with a large bay window facing south. The eastern ward pavilion contains on each of two floors two large general wards with twenty beds in each, arranged in pairs between the windows, a small ward, two ward sculleries, two nurses' rooms, and a staircase. The water-closets and bath-rooms are placed in octagonal towers flanking the ends of the ward pavilions, and balconies are constructed at the ends of the wards between these two towers. The western pavilion is similar to the eastern on the upper floor, but on the ground floor the southern half is taken up by the out-patient department.

The Middlesex Hospital.—In the year 1745 the Middlesex Hospital was established “for sick and lame patients” in Windmill Street, Tottenham Court Road; and in 1745 a ward for the reception of lying-in married women was added. The building thus utilised soon proved inadequate for its purposes, and the lease of a site, called Mary-le-bone Fields, having been secured from Mr. Charles Berners, the nucleus of the present hospital was erected in 1755. In 1792 an anonymous donor, afterwards known to be Mr. Samuel Whitbread, gave a sum of money to endow a cancer ward. This, with subsequent gifts and bequests, forms the noble and unique charity by which provision is made for the victims of this terrible malady—a permanent refuge where those afflicted are kept and tended “until relieved by art or released by death.” Towards the close of the last century the hospital received within its walls a number of destitute French emigrants who had been driven over to this country by the Revolution. In 1775 the wings were completed, and no further alterations were made until 1834, when the wings were extended towards the street. In the following year the school was erected. In 1848, and again in 1860, additions were made. In 1868–69 the home for trained nurses was built, and in 1878–79 it was enlarged. In 1883–84 the out-patients’ department was remodelled and additional accommodation provided for the medical and nursing staff. In 1887–88 the nursing institute and the residential college for students were built, and the medical school enlarged. The above is an outline of the structural history of the Middlesex Hospital, and it is a very fair sample of the gradual development of a great town hospital. The plan, though coming within the sub-class now under consideration, does not show the form of the type in so marked a degree as do others. The additions made to the east have the effect of adding on, as it were, an additional up stroke to the H. The site upon which the hospital stands is almost a self-contained one, the only exceptions being the long narrow strip of houses in Union Street and the three houses in Cleveland Street, the centre one of which is, however, in the possession of the hospital. The principal entrance is in the centre of the courtyard facing Mortimer Street. The central block contains, in the basement, the kitchen offices; on the ground floor, offices and board room; on the first and second floors, resident officer’s rooms; and on the third floor, wards. The west wing contains, on the ground floor, two large wards, operation theatre, and chapel, and on the upper floor, wards. The front or south part of the east

wing is, together with the building in Cleveland Street, devoted to the out-patient departments and dispensary. The back part is a general ward. The remainder of the Cleveland Street wing is taken up with the training-home for nurses and the trained nurses' institute. The upper floors of the east wing are all wards, while the Mortimer Street end of the Cleveland Street wing is occupied by resident officers' rooms, porter's and steward's rooms, and ward for sick resident officers. The upper floors of the remainder of the Cleveland Street wing contain the rest of the training home and institute. The laundry is situated under the north-east wing. The medical school buildings form the north-west and north boundary of the site, and adjoining the north-east angle is the residential college for students. A notable feature in this hospital is the garden, where in summer weather many patients may be seen enjoying the fresh air in their beds under the shade of the trees. Since the plan given in the portfolio was prepared, an important alteration has been made by the removal of the post-mortem room and dead-house. That portion of the range of school buildings on the western side of the site marked "mortuary" and "lecturer's room" has been removed and a new building three storeys in height erected in its place. The basement contains a coffin store and a store-room for the lecturer on chemistry. The ground floor contains the mortuary and the lecturer's private room, and the first floor contains the post-mortem room. A lift is provided for conveying bodies from the basement to the upper floors, and a subway gives access to the basement of the hospital. The space formerly occupied by the post-mortem room and dead-house is to be covered by a chapel.

Norfolk and Norwich Hospital, Norwich.—The date of the foundation of this hospital is the same as that of Leicester. The original building, the plan of which is published in the report of Dr. Bristowe and Mr. Holmes (*op. cit.*), was roughly in the form of an H with excrescences at the four corners. The wards were all corridor wards, and the whole building was in intimate atmospheric communication one part with all the others. In 1875 the advice of the Medical Officer to the Local Government Board was asked, in consequence of a tendency, which made itself manifest, to fatal pyæmia and erysipelas amongst the surgical cases, and accordingly the late Mr. Netten Radcliffe made an inspection of the hospital. His report is published in the "Sixth Annual Report of the Local Government Board," 1876-77 (Supplement). Following upon this

report it was determined at first only to make structural alterations in the buildings; but finally it was resolved to erect an entirely new hospital, retaining only a very small portion of the old buildings. The hospital proper is in its main lines very much like that of Lincoln. There is the large central block projecting out on either side of the main corridor, and the two sets of double pavilions containing the wards. The front portion of the central block contains, on the ground floor, office and board room, surgery, matron's room, and store and dispensary. A large waiting-hall occupies the centre, and extends to and includes the main corridor. In the basement of the block are the kitchen offices, and the kitchen is dependent both for light and ventilation on a square shaft which is carried up through the waiting-hall and covered with a skylight. The two upper floors are devoted to the residential quarters of the staff. The back portion of the central block is of one storey only, and is separated from the front block by a short length of corridor. It contains the operation theatre and seven small wards, with a nurse's room, scullery, bath-room, and water-closet. A serious blemish in an otherwise excellent arrangement is the position of the water-closet, which is in direct communication with the corridor. The ward pavilion on the north-east contains on each floor two general wards for twenty-four beds each, two separation wards of two beds each, two nurses' rooms, and two ward sculleries. The pavilion at the other side contains on the ground floor one general ward for twenty-four beds, with separation ward, nurse's room, and scullery, and a boys' ward for thirteen beds, with a smaller ward and nurse's room and scullery. The upper floor is arranged similarly to the north-east pavilion; the water-closets and bath-rooms are arranged in a similar manner to those at Lincoln. Adjoining the corridor end of the south-west pavilion is a nurse's dining-room and the chapel. A detached block at the western extremity of the site is all that is left of the old hospital. It contains the out-patient department, museum, and two isolated wards. At the back of this building is the mortuary and post-mortem room.

Queen's Hospital, Birmingham.—This hospital comprises a general block and an isolation block, both of which are planned in the form of an H, and a detached out-patient department.

St. George's Hospital, London.—In the year 1734, Lanesborough House, Hyde Park, was opened by a committee of gentlemen as a general hospital. Out of this undertaking grew in course of time the hospital now known as St. George's, with its affiliated con-

valescent charity and medical school. The old house, originally the residence of Lord Lanesborough—immortalised by Pope as “sober Lanesb’row dancing in the gout,”* and of whom it is recorded that shortly before his death the golden gallery of St. Paul’s Cathedral was gilt at his expense†—becoming in course of time, and notwithstanding additions, too small for its requirements, was rebuilt during the period 1827 to 1834. Various additions have been made from time to time, the last being in 1879. The plan of the hospital, omitting buildings on the basement level of one storey only, is in the form of an H, with a piece tacked on to the left-hand up-stroke projecting out at an angle thereto, and with those parts of the upright stroke very much longer above the cross stroke than below. The plan differs essentially from that of Lincoln in having no separating corridor between the central block and the ward pavilions, and also in the fact that on the upper floors the central block itself is occupied by wards. The out-patient department, and all the kitchen offices, are placed in the basement. On the ground floor the central part is occupied by the offices and surgeries. The whole of the first floor is taken up by wards, except that portion of the central block which contains the chapel. All the wards are in more or less direct communication with each other.

Worcester Infirmary.—The plan of this hospital in its main features more nearly resembles that of Bedford than any other. Two ward blocks joined together by a transverse block, principally

British Hospitals.—Class 2, Sub-class 2D.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Lincoln	105	8'75	115'27	14'00	1,613'78	32'00	3,320'76
St. George's, London	351	9'00	112'66	14'66	1,652'47	28'12	166'70
Middlesex, London	308	—	{ 109'25	{ 13'75	{ 1,505'00	{ 13'00	{ 273'31
			{ 109'50	{ 15'25	{ 842'18	{ 15'00	
Bedford	72	7'00	86'66	12'00	1,039'92	14'00	16,655'00
Bristol Royal	264	7'50	78'75	14'00	1,102'50	20'50	253'68
Leicester	189	6'00	101'00	16'00	1,606'00	21'33	1,267'61
Norfolk and Norwich	220	8'00	108'33	14'00	1,516'62	17'58	1,070'00
Queen's, Birmingham	120	10'00	85'71	12'83	1,099'65	21'72	726'00
Worcester	100	8'50	{ 102'94	{ 14'00	{ 1,301'16	{ 17'25	{ 762'30
			{ 85'18	{ 12'00	{ 1,192'52		
Chesterfield	48	10'00	82'00	12'00	984'00	22'00	907'50

* Highest. † Lowest. ‡ Approximate. § One-eighth of the window-space is in corridor windows
|| Old wards. ¶ New wards.

Published plans :—Leicester : Oppert, Bristowe and Holmes. Bristol Royal : Oppert, Bristowe and Holmes. Norfolk and Norwich : Oppert, Mouat and Snell. Worcester : Bristowe and Holmes. St. George's : Oppert, Bristowe and Holmes.

* *Moral Essays*, i. 230.

† *Lyson's Middlesex*.

devoted to administrative purposes, and with a chapel projecting out at the back, fairly describes the plan. The operation room, with a male ward on each side, occupies the centre of the transverse block. The out-patient department is placed partly in the basement of the right-hand wing, partly in a one-storey building annexed thereto. The remainder of the basement is devoted to kitchen offices, with servants' bedrooms underneath the chapel. There is a detached laundry and a mortuary.

Sub-class 2E.—FOUR BLOCKS ARRANGED ROUND A QUADRANGLE AND CONNECTED TOGETHER AT THE ANGLES.

Type: Royal Free Hospital, London. See page 181.

King's College Hospital, London.—This, the youngest but one of the large London general hospitals with medical schools attached, was founded in 1839. In plan it differs from the Royal Free in that its quadrangle is cut in twain by a corridor building connecting two of the sides; and it is more open on three of its exterior sides than the former building. The site is bounded on the north-west by Portugal Street, and on this side there is a large entrance courtyard. The south-west boundary is a narrow street, St. Clement's Lane, and a poor and densely-populated neighbourhood. To the south-east, many houses have recently been demolished, leaving the hospital open to the ground at the side of the Law Courts. The north-east boundary is formed by Carey Street. On the ground floor the greater part of the building is devoted to the out-patient department, offices, and residents' rooms, post-mortem room, and class-room, and one ward. The basement contains the kitchen offices, the out-patients' waiting-rooms, the mortuary, and residences for the staff. The upper floors contain the wards, some of which are double, the operation theatre, and the chapel. A striking feature in the plan is the main staircase, which occupies a very large space, and performs efficiently the part of a shaft for connecting together the various wards and other parts of the hospital. The plan of this hospital presents almost every defect that can be named. The closed-in courtyards prevent the free circulation of the air; the wards themselves, placed either back to back or side by side, further impede the access of air to one another; and the great staircase connecting all the parts into one atmosphere, in which the post-mortem room and mortuary are included, must entirely preclude the possibility of isolating the air of any one ward from the general atmosphere of the hospital. It

has been suggested that the removal of all the sashes from the windows in the great staircase would render the hospital more healthy than it is. Such a drastic measure would probably have the desired effect so far as the patients are concerned ; but it is to be feared that the effect on the nurses and resident staff would be injurious.

Royal Free Hospital, London.—This hospital was established about the beginning of the present century, and found a home in a building which was originally the barracks of the Volunteer Horse Artillery. Additions made in subsequent years have more than doubled the size of the hospital. The plan is that of a quadrangle, completely surrounded by buildings. On the north and south sides, and particularly on the east, the site is hemmed in by high buildings. The west side abuts upon Gray's Inn Road. The front building is occupied by the board room and office, gateway entrance, surgery, and resident officers' quarters. The north and south wings are wards, which are so close to the adjoining buildings that the cross-ventilation must be scarcely more than a pretence. In each instance, also, the greater part of the area between the wards and the adjoining buildings is converted into a closed-in well by the projecting water-closet buildings which fill up the intervening space. The eastern building is partly devoted to wards, partly to inquest-room and nurses' quarters. At the back of this building is an open yard, at one side of which is a one-storey building, containing museum, mortuary, and post-mortem room.

British Hospitals.—Class 2, Sub-class 2E.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Royal Free, London	160	*11'00 {	†156'75 ‡120'12	15'00	{ †2,351'25 ‡1,801'80	*21'50	252'45
King's College, London .. .	206	—	—	—	—	—	212'00

* Approximate. † Highest. ‡ Lowest.
Published plans :—King's College : Galton. Royal Free : Oppert, Nightingale.

Sub-class 2F.—A SINGLE STRAIGHT BLOCK.

Type : Inverness Northern Infirmary. See page 183.

Arbroath Infirmary.—The plan of this building is very similar to that of the Inverness Infirmary. The wing at the back is only one storey in height, and the wards on the upper floors of the main block have windows on the opposite sides. The water-closets open

directly into the wards. A detached block of one storey only, and of more recent date than the main building, contains two wards, with a nurses' room, and with water-closets separated from the wards and by ventilated lobbies.

Dewsbury and District Infirmary.—The plan of this building can hardly be called a single straight block, inasmuch as it consists of two straight blocks placed at right angles to one another, and forming together the letter T. The building was erected in 1881, and might therefore fairly be expected to have been planned in accordance with modern knowledge of hospital requirements. That this is not the case, unfortunately, the plans show only too clearly. The front block contains, on the ground floor, the main entrance, casualty-room, resident medical officers' rooms, matron's sitting-room, a special ward, bath-room, with two water-closets and sink connected with the lobby leading to the bath-room, a ward kitchen, and a nurse's room. The water-closets leading out of the bath-room lobby are apparently disconnected from the latter by a lobby, but the sink is not enclosed, and is therefore in direct communication with the corridor. There are, moreover, in the lobby two shoots, one for dirty linen, the other for dust. Every arrangement that can be made for fouling the air of the hospital by emanations from water-closets, slop sinks, dirty linen, and refuse is made. In addition to the water-closets built out for the use of the special ward, there are two others, one for the matron, and one for the doctor, which are placed inside the building, with no attempt at disconnection. The upper floor contains a series of private wards, the matron's bedroom, and the operation room, and the same arrangement of water-closets and shoots as on the ground floor. The ward block projects out from the centre of the front block, and contains two wards for sixteen beds each. The water-closets and bath-rooms are placed in projecting wings set angle-wise across the corners of the free end of the ward. The disconnection of the water-closets would appear from the plans to be even less complete than in those of the front building, and the same arrangement of slop sink and shoots for dust and foul linen occurs here. The beds are arranged singly, but no care has been taken to ventilate properly the end beds. The mortuary and laundry are detached buildings.

Dr. Gray's Hospital, Elgin.—In the absence of any plans of this hospital, it can only be said that it belongs to the sub-class now under consideration, that it was built in 1819, and has received no subsequent additions. Small-pox appears to be treated in the

same house as the general patients, the only separation being an independent staircase.

Inverness Northern Infirmary.—Very few, if any, hospitals will be found to conform strictly to the type of a single straight block, inasmuch as in most cases some projection or other will be found to exist. This is the case in the plan chosen as the type of the sub-class. The main building is a straight block, but at the back is a projecting wing. The front or main block contains wards of various sizes, for eight, six, three, and two beds, some for only one bed. Some of these wards are the whole width of the building, and have windows at each end; whilst the rest are entered from corridors, or out of other wards. The whole block is in intimate atmospheric communication one part with another. Besides the wards, the block contains all the residential quarters for the staff. The wing at the back contains the kitchen offices and laundry, and on the upper floor the operation room, with a nurses' room, bath-room, and water-closet adjoining. The water-closets are in some cases built out from the main building, with intervening lobbies, and in others are within the building. The mortuary and post-mortem room are attached to the kitchen wing, though entered from the outside only. There is a detached block of fever wards, the plan of which is a single straight block, similar to the hospital.

Staffordshire County Infirmary.—This is one of the many county hospitals erected in the last century. The first portion was built in 1766; two wings were added subsequently, the exact date of which is unknown; the fever wards were built in 1829, and the laundry and other additions more recently still. The building consists of a single block, more or less irregular in form, but coming well within the category of the sub-class. The wards are all arranged on the corridor plan, except those in the fever wing, and of disconnection to water-closets there is none. The laundry is a detached building.

British Hospitals.—Class 2, Sub-class 2F.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
Inverness Northern Infirmary	90	ft. varies	ft. 87'00	ft. 10'25	ft. 891'75	ft. —	ft. —
Arbroath	50	5'75	74'55	13'00	969'75	2'63	820'10
Elgin, Dr. Gray's Hospital	70	6'75	71'87	10'50	754'63	18'00	1,866'85
Dewsbury (main wards)	50	9'00	123'75	—	—	—	—
Staffordshire County Infirmary	120	5'50	67'05	12 83	860'25	7'32	990'82



CHAPTER VIII.

CLASS 3.—CORRIDOR HOSPITALS.

Sub-class 3A.—SINGLE CORRIDOR HOSPITALS.

Type: Dundee Hospital. See page 185.



CHALMERS' HOSPITAL, BANFF.—The main outline of this hospital resembles that of Dundee, with the omission of the central projection in front, and the addition of projections at each end of the front block and at the free ends of the three wings.

The main entrance is in the centre ; to right and left of the vestibule are two rooms, one being the matron's dining-room, the other her drawing-room. To each of these rooms a small pantry is attached, the use of which as connected with a drawing-room it is difficult to perceive. On each side of these rooms is a ward with scullery and pantry attached ; whilst beyond there are, at each end, a passage, staircase, bath-room, water-closet, and, forming the front projection described above, a private ward. The central wing at the back contains the main staircase, surgery, waiting-room, kitchen offices, and laundry. The last-named department forms the cross-piece at the extreme end, and communicates with the kitchen corridor. The upper storey over part of this wing contains bedrooms for staff, and the operation room. The side wings are alike, and contain each a ward for four beds, nurse's room, staircase, scullery, water-closet, and two private wards. The mortuary and post-mortem room adjoin the right-hand wing, but are entered only from the outside. There is a separate fever hospital consisting of two blocks with an area intervening, one block being devoted to small-pox patients, the other to fevers. Each block has two wards, a nurse's room, bath-room, and water-closets.

Dundee Hospital.—The general form of the plan of this hospital is one long front block, with three blocks projecting at right angles therefrom at the back. In the centre of the main front block is a projecting building containing administration offices, residences, &c. At the back of the front block a corridor runs the whole length of the building, in front of which are the wards. The bath-rooms, water-closets, and lifts are placed on the opposite side of the corridor to the wards. The centre wing contains on the ground floor kitchen and other domestic offices, and nurses' and servants' rooms above. The left-hand wing contains on the ground floor the out-patient department and cellars, with wards above. The right-hand wing contains coal cellars and fireman's house on the ground floor, and wards above. There is a detached building of one storey containing the laundry department, and another detached building in which are the mortuary and post-mortem room.

Greenock Infirmary.—This hospital consists of two separate departments, the medical and surgical house, and the fever house. The buildings, however, though they do not communicate, are all joined together, and the fever house is really only a wing of the general hospital. The plan is very irregular and does not at all resemble either of the preceding. At the back of the main front block are two courtyards, one entirely shut in by buildings, the other enclosed wholly on three sides and partly on the fourth side. The fever house forms the further part of the right-hand wing. The whole of the ground floor is occupied by administration offices, with the laundry and mortuary at the back. The wards are on the upper floors.

British Hospitals.—Class 3, Sub-class 3A.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Dundee	250	8'83	100'00	14'00	1,400'00	{ ^{15'21} †2'81}	1,742'50
Chalmers' Hospital, Banff..	80	6'00	95'25	12'83	1,221'95	10'75	630'25
Greenock	230	—	—	—	—	—	—

* Windows in outer wall.

† Windows in corridor wall.

Published plans :—Greenock : Bristowe and Holmes.

Foreign Hospitals.

Hospital on the Coolsingel, Rotterdam.—The ground plan of this hospital has more the appearance of a group of buildings planted down at haphazard without relation to each other than of

a systematically designed institution. The buildings consist of a long L-shaped main block, of which various wings are projected, and ten other detached blocks, mostly of small size. The ground floor of the main building contains the out-patients' department, a large vaccination department, quarters for male servants and attendants, for female servants and for nurses, Russian, vapour, and ordinary baths, and isolation wards. The upper floor is not continuous, there being a break between the wing facing north and that facing east. In the east wing are four wards of ten beds each for male patients, four wards for ten beds and one ward for four beds for female patients, operation room, consulting-room, and rooms for doctors and directors. The wards are lighted at one end only, and the water-closets are all entered directly from the corridors. Part of the north wing is occupied by the laundry; the rest contains wards (in this case cross-ventilated), surgeons' rooms and day-rooms. The detached buildings are: (1) kitchen offices; (2) head attendants' house; (3) disinfecting house; (4) workshops; (5) store-keeper's house; (6, 7, 8 and 9) ward blocks containing a male ward for six beds and a female ward for four beds, and an isolation ward; (10) mortuary and post-mortem house.

Foreign Hospitals.—Class 3, Sub-class 3A.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site
		ft.	ft.	ft.	ft.	ft.	ft.
AUSTRIA-HUNGARY.							
Grosswardein	240	—	—	—	—	—	—
Brothers of Charity Hospital, St. Veit in Carinthia	50	—	—	—	—	—	—
Salzburg, St. Johanns Spital	230	—	—	—	—	—	—
Lenz	150	—	—	—	—	—	—
Lemberg	880	—	—	—	—	—	—
Innsbruck	204	—	—	—	—	—	—
*Graz	833	—	—	—	—	—	—
Swwechat, Workmen's Hospital	—	—	—	—	—	—	—
Vienna, Jews' Hospital	—	—	—	—	—	—	—
Vienna, Dr. Eder's Private Hospital ..	40	—	—	—	—	—	—
BELGIUM.							
Ghent, Hospital for Sick Workmen ..	—	—	—	—	—	—	—
Civil Hospital	—	—	—	—	—	—	—
St. Nicholas	650	—	—	—	—	—	—
DENMARK.							
Commune Hospital, Copenhagen ..	977	—	—	—	—	—	—
FRANCE.							
Hôpital Broussais, Paris	260	—	—	—	—	—	—
Hôtel-Dieu, Marseilles	—	—	—	—	—	—	—
Charité, Marseilles	—	—	—	—	—	—	—
Hôpital Hospice, Versailles	—	—	—	—	—	—	—
Maison Municipale de Santé (for paying patients), Paris	344	—	—	—	—	—	—
Villeneuve (Lot)	100	—	—	—	—	—	—

* Includes lunatics.

Foreign Hospitals.—Class 3, Sub-class 3A—continued.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
GERMAN EMPIRE.							
St. Hedwig's, Berlin	275	—	—	—	—	—	—
Bethanien, Berlin	350	—	—	—	—	—	—
Hamburg General	—	—	—	—	—	—	—
Municipal Hospital, Bonn ..	100	—	—	—	—	—	—
Bremen	272	—	—	—	—	—	—
Frankfort-on-the-Main	245	8'00	100'00	16'00	1,600'00	—	—
Göttingen	100	—	—	—	—	—	—
Hanover, City Hospital	250	—	—	—	—	—	—
Henriettentiftung, Hanover ..	100	—	—	—	—	—	—
General Hospital, Kiel	200	—	—	—	—	—	—
City Hospital, Cologne	7800	—	—	—	—	—	—
Berlin, Jews' Hospital	100	—	—	—	—	—	—
Osnabrück Iron Works Hospital ..	—	—	—	—	—	—	—
Zwickau, Saxony, Dr. Schlobig's Private Hospital	—	—	—	—	—	—	—
Bielefeld	—	—	—	—	—	—	—
Kaiserswerth	—	—	—	—	—	—	—
Stuttgart Charlottenhölfe Hospital ..	—	—	—	—	—	—	—
Tannwald District Hospital	—	—	—	—	—	—	—
Werl in Westphalia	100	—	—	—	—	—	—
HOLLAND.							
Rotterdam	265	6'60	66'00	14'00	924'00	—	—
RUSSIA.							
St. Petersburg, Alexandrow Hospital ..	—	—	—	—	—	—	—
Clinic of Grand Duchess Helen ..	—	—	—	—	—	—	—
Count Valerian of Zoubow's Hospital ..	—	—	—	—	—	—	—
SWEDEN.							
Maria Hospital, Stockholm	—	—	—	—	—	—	—
Provincial Hospital, Falun	124	—	—	—	—	—	—
SWITZERLAND.							
St. Gallen Cantonal Hospital	—	—	—	—	—	—	—
Zürich Cantonal Hospital	—	—	{ * 101'50 † 110'72	—	{ 1,218'00 1,328'84	{ 5'48	—
Geneva Cantonal Hospital	350	—	—	—	—	—	—
Fribourg Academical Hospital	200	—	—	—	—	—	—
Basel	300	—	—	—	—	—	—
Glarus, Cantonal Hospital	56	8'74	97'53	13'12	1,259'49	—	—

* Medical wards.

† Surgical wards.

Published Plans:—Grosswardein: L. Klasen. St. Veit: L. Klasen. Swechat: Max. Kraft, "Arbeiter-Wohnhäuser." Vienna: Jews' Hospital: L. Klasen. Dr. Eder's Hospital: Förster, "Allgemeine Bauzeitung." Rudolph Hospital: L. Klasen. Villeneuve: "Choix d'Edifices Publics." Hamburg: Oppert, "Zeitschr. f. Bau." Bethanien: L. Klasen. Bremen: Oppert, "Zeitschr. f. Bau." Berlin, Jews' Hospital: L. Klasen, "Zeitschr. f. Bau." Osnabrück: L. Klasen. Zwickau: L. Klasen. Bielefeld: "Architekton. Skizzenb." Kaiserswerth: Romberg, "Zeitschr. f. prakt. Baukunst." Stuttgart: L. Klasen. Tannwald, "Deutsch. Baugewerks." Werl: "Allgemeine Bauzeitung." Rotterdam: Bakkeus (L. van), "Afbeeldingen van het nieuwe Ziethuis te Rotterdam"; L. Klasen, "Zeitschr. f. Bauw." Riga: "Russisch. Medic. Zeitschr." Clinic of Grand Duchess Helen: Zotschy, "St. Petersburg Art and Art Technical Journal," 1885. Count Valerian's Hospital: Rusca (Luigi), "Raccolta dei Disegni di diverse fabbriche costrutte in Pietroburgo." St. Gallen: L. Klasen. Zürich: Wigman and Zeuchner, "Baubeschreibung der projecten neuen Anlage eines Krankenhauses," 1851.

Sub-class 3B.—DOUBLE CORRIDOR HOSPITALS.

Type: Manchester Royal Infirmary. See page 188.

Belfast Royal Infirmary.—The central portion of this hospital, which was erected in 1817, comes within the category of double

corridors, but the wings, which were erected in 1864 and 1865, belong more to the class of pavilion hospitals. The central block is four storeys in height; in the basement are kitchen offices, stores, and servants' dormitory; on the ground floor, theatre, board room, resident officers' rooms, and two small wards; on the two upper floors, wards. The west wing contains in the basement, stores, lecture-room, &c.; and, on the ground and first floor respectively, a ward with staircase, ward kitchen, bath-room, and water-closet. The east wing has only a partial basement; the ground floor contains two wards with their offices, and the "extern" or out-patient department; on the upper floor are two general wards and two private wards. There are, in addition to the above, three detached buildings. One is devoted to the laundry. The second contains two storeys of fever wards, and the third isolation wards for erysipelas and burns, and the mortuary.

Manchester Royal Infirmary.—The history of this hospital is a particularly interesting one, both from a medical and a sanitary point of view.* Founded in 1753, it included an infirmary, dispensary, lunatic hospital, and asylum and public baths. With the exception of the baths, the whole of these institutions still form part of the charity, though not all under the same roof. The first records of the hospital that yield any information as to its condition begin with the year 1838. The crowded state of the wards and the inconvenience arising therefrom, particularly from the number of "double beds" in use, is apparent in a report of the medical committee. Erysipelas makes its appearance now and again, and its relation to the practice of dry-rubbing the wards or its discontinuance is curious and interesting. It appears that on one occasion the house surgeon reported that for some time before the practice of dry-rubbing was adopted "almost every operation was followed by more or less severe attacks of erysipelas, and the mortality amongst these cases was very great. But since dry-rubbing had been practised 'only one case of erysipelas following accident or operation had occurred in the hospital,' and the aspect of wounds of all kinds from the slightest to the 'most severe had also materially improved.'" (N. Radcliffe, *op. cit.*) Constantly recurring outbreaks of erysipelas and complaints of overcrowding and consequent unhealthy conditions continued until, in 1848, a radical change was set on foot by the removal of the insane patients to a

* For much valuable information respecting this hospital we are indebted to the late Mr. Netten Radcliffe's Report to the Local Government Board, 22nd September, 1876.

new hospital built at Cheadle. In the same year the south wing was completed, and in 1851 the north wing was opened. In 1852 the Manchester house of recovery was united to the infirmary, and wards were thereupon set apart for fever patients. In 1853 and again in 1855 the extreme unhealthiness of the surgical wards is recorded, and in 1856 a sub-committee reported that they found the ventilation of the house defective, especially notable being the fact that a ventilation shaft from the dead-house communicated by several apertures with the women's surgical wards. A special arrangement for ventilating the drains and sewers into the spaces in the roof, and so into the corridors and wards of the hospital, is also recorded. Again, in 1861 a medical sub-committee reported on the continued unhealthiness of the hospital and made certain recommendations, many of which were carried out. These alterations consisted chiefly in improved ventilation and lighting to corridors and wards and in the sanitary arrangements. From 1863 to 1868, the unhealthy conditions still continued to exist, notwithstanding the improvements that had been effected, and gangrene, pyæmia, and erysipelas make their appearance more or less persistently in the hospital records. Two very important measures were adopted, one being the establishment in 1867 of the Barnes Convalescent Home, and the other the opening of the Fever Hospital at Monsall in 1871. The removal of the convalescents and of the fever patients set free a large number of beds, and advantage was taken of this to increase the space per bed. For the two years following the removal of the fever patients the hospital appears to have been comparatively free from traumatic diseases, but in 1874 the old state of things reappeared and continued during the two following years, and in 1876 the trustees invoked the aid of the medical department of the Local Government Board in discovering, if possible, the causes at work in producing this long-continued condition of unhealthiness.

The plan of the building is that of a quadrangle surrounded on three sides by buildings. Within the area thus enclosed are placed in a basement storey the kitchen offices, washhouse, and boiler-house, with subsidiary offices. The whole of the building is traversed by a central corridor, on each side of which the wards are placed. Four staircases, two in the central block, and one in each wing, connect the different floors; and in addition the storeys are connected with each other by openings in the corridor floors and by two hoists, one at each angle of the main front building.

The out-patient department is a separate building of one storey only in height, and is placed just beyond the open side of the quadrangle.

In the report from which so much of the foregoing history is extracted, Mr. Netten Radcliffe examined minutely the relation of structural arrangements to unhealthiness of wards. He first pointed out that the intimate communication which exists between the wards and the corridors, and between the different floors by means of the corridors and staircases, must promote the widest diffusion of any "fouling of the internal atmosphere" all over the building. "In proportion," he remarked, "as the ventilation of the wards into the corridors is efficient, the chances of a wide distribution of the fouled air is increased." The next point of structural arrangement is the position of the water-closets, which are so placed that the set of the air from these offices must generally be into the hospital instead of away from it. The position of the dispensary or out-patient department, as it existed at the time of the report, in the ground floor of the north wing is pointed out as being an objectionable one. This defect no longer exists. Mr. Radcliffe further pointed out that in wards placed on each side of a central corridor, and lighted and directly communicating with the outer air on one side only, a different standard of space should be adopted to that which is applicable to wards with cross-ventilation. Put into plain English, the conclusion he arrived at was that the wards were overcrowded, and that for corridor wards of this type much greater superficial and cubic space is necessary than was here provided. Lastly, the position of the dead-house and post-mortem room and the laundry were condemned as being in too intimate communication with the air of the hospital.

Queen's County Infirmary, Maryborough.—This hospital was erected in the year 1808, and was added to in 1842, and again in 1861. The plan consists of the main block, which is a rectangle, divided longitudinally by a corridor, on each side of which the wards are placed, a laundry block and out-houses forming a wing to the main block, and a detached block of fever and separation wards.

Seamen's Hospital, Greenwich.—"The 'Seamen's Hospital Society' owes its origin to the Committee appointed to manage the fund subscribed in the winter of 1817-18 for the temporary relief of distressed seamen, who were at that time to be found in great numbers in the streets of the metropolis."* The direct outcome of

* *Origin and Progress of the Seamen's Hospital Society*, being an appeal on behalf of the Charity.

this fund was the establishment in 1821 of a permanent floating hospital on the Thames for sick and diseased seamen. The hospital was first established in the "Grampus" (a 50-gun ship) moored off Greenwich, which, proving of insufficient size to take in all the numerous applicants for admission, was in 1830 exchanged for the "Dreadnought" (104-gun ship). This vessel becoming very unhealthy, was in 1857 replaced by H.M.S. "Caledonia" (120 guns) and her name was altered to the "Dreadnought." The society was incorporated in 1832, and the Act of Incorporation empowers the Committee to build a hospital on shore, or to continue their establishment afloat. For various reasons it was considered that a properly-constructed hospital on shore would be more suitable to its purpose than a floating hospital. The ventilation to be obtained between the ship's decks was most imperfect; the wards being long and low the ports were necessarily close to the patients' heads. When the weather was such that it was possible to open the ports, the cold air must blow too directly on to the patients. In foggy weather the ports had to be kept closed, and so ventilation became impossible. The want of light, and the noises incidental to the mode of construction of a ship, also conducted very greatly to the difficulty of keeping the wards healthy. Just about the time when all these considerations were pressing upon the committee the necessity for establishing the hospital permanently ashore, the Royal Hospital at Greenwich was emptied of its former tenants, and it occurred to the committee that no more suitable building could be secured than the infirmary of the hospital with the adjoining Somerset ward. Towards the maintenance of the Royal Hospital, of which the infirmary was an integral part, the members of the Mercantile Marine had always contributed by forced payments without feeling that they had received any equivalent. The removal of patients to the permanent building was effected on the 13th April, 1870, since which time the institution has continued to occupy the buildings now to be described.

The buildings consist of two blocks; the larger of the two encloses a long oblong quadrangle, in the centre of which is the kitchen and bath-room; the smaller is a simple oblong building placed at one side of the larger block. The east and west sides of the quadrangular building are occupied by patients almost entirely, and are three storeys in height. The adjoining block is wholly occupied by patients, and is one storey only in height. The wards are all small and contain two, three, and four beds apiece. "The

advantages enjoyed by the patient in these small wards are isolation, quietude, equable temperature, and a sense of comparative privacy. Such wards can also, after occupation by contagious cases, be cleaned, purified, and kept empty for some time, without detriment to the general working of the hospital." * A dining-hall for convalescent patients is provided on every floor with a ward scullery adjoining. A chapel was erected over the centre of the Somerset ward (the one-storey wing) in 1888, and in the same year the hospital was entirely re-drained, and the sanitary arrangements generally improved.

Westminster Hospital.—This hospital began its existence in a small house in Birdcage Walk in 1715, under the name of the "Publick Infirmary for the Sick and Needy." At the time of its foundation the only two hospitals then in existence for the medical and surgical relief of the poor were St. Bartholomew's and St. Thomas's, Guy's Hospital not coming into being for some few years later. Westminster Hospital is also remarkable as being the first institution of the kind founded by voluntary contributions from the public. After existing for nearly five years as an out-patient hospital only, the hospital in Birdcage Walk was opened in 1724 for in-patients with 30 beds. In 1724 the hospital was moved to Chapel Street and enlarged to 60 beds. At this period Cheselden, the teacher of John Hunter, became one of the surgeons, and continued to hold that post for fifteen years. In 1733 the hospital was removed to a still larger building in James Street, where it remained for 101 years. This step, however, evoked a strong protest from a large number of governors, who desired to move the hospital to Lanesborough House, Hyde Park Corner. Being defeated, they, with some of the staff, seceded and founded St. George's Hospital on the site referred to. In 1834 the present building was opened for the reception of patients, and in 1849 the medical school was attached to the hospital. The site is nearly a semicircle, and is bounded on the south and east by Broad Sanctuary and the large open space around Westminster Abbey, on the west by Princes Street, and on the north by H.M. Stationery Office. The ground is almost entirely covered with buildings, the bulk of which are three storeys in height in addition to the basement. The out-patient department and the administrative offices occupy the basement. The ground floor is partly occupied by the rooms for resident medical officers, partly by wards, and the upper floors are

* Appeal, *op. cit.*

entirely devoted to wards and nurses' accommodation. A wide corridor occupies the centre of the front portion of the building, on each side of which wards are placed. In each angle formed by the junction of the front portion with the wings, a staircase of triangular plan is placed, and a third staircase occupies the central space at the back of the main corridor. Two lesser corridors run off at right angles to the front corridor with a ward at one side, and one at the end of each. The water-closets are placed, with the ward sculleries, in octagonal angle turrets—a recent addition. Wards for the isolation of infectious diseases are placed at the top of the building, the access to them being through the open air.

York County Hospital.—An instructive history belongs to this hospital, which is one of the most interesting examples of the complete failure of artificial ventilation in this country. The original building was erected in 1849, and was provided with an apparatus by means of which the air, after being warmed over a series of hot pipes, was driven into the wards by mechanical means and the foul air sucked out by some form of aspirator. So large a degree of confidence was felt in the power of this contrivance that the windows were merely glazed panels with no means of opening, and the wards were unprovided with fireplaces. "This system remained in operation for several years from about 1850–59. The wards were always close, sickly, and even offensive. The patients complained of the deprivation of fresh air, and the medical officers also complained of the state of the hospital. Worse than this, the health of the patients suffered, especially those who were submitted to any operation, however trifling."* In a word, the hospital went from bad to worse, until the surgeons abandoned operations of all kinds rather than incur the almost certain risk of a fatal termination. So, at last the hospital had to be emptied and cleansed, windows made to open, fireplaces and chimneys substituted for hot air, and the elaborate apparatus abandoned. The original building consisted of one straight block of four storeys and basement. The wards are placed on each side of a central corridor. In 1883 a wing was added containing on the ground floor the outpatient department, and on the upper floor the "Watt Ward" with appurtenant offices. This wing was enlarged in 1888. It communicates with the older building by a covered corridor.

* Bristowe and Holmes, *op. cit.*

British Hospitals.—Class 3, Sub-class 3B.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Manchester Royal	297	—	{ ^{*117'00} †70'00	13'00	{ ^{*1,766'00} †983'00	—	—
Seamen's, Greenwich	258	8'33	83'33	12'00	999'96	9'33	436'28
Westminster	200	6'00	85'72	14'25	1,221'51	11'45	124'98
York	131	6'00	71'00	15'50	1,068'55	20'57	1,016'80
Queen's County Infirmary, Maryborough	100	—	—	13'00	—	—	—
Belfast Royal	174	5'50	98'00	16'50	1,617'00	33'00	332'60

* Highest.

† Lowest.

Published plans :—Manchester Royal : Oppert, Nightingale, Bristowe and Holmes. Westminster : Oppert, Bristowe and Holmes.

Foreign Hospitals.—Class 3, Sub-class 3B.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
BELGIUM :							
Wavre	—	—	—	—	—	—	—
GERMAN EMPIRE :							
Berlin, St. Gertrandt's Hospital ..	—	—	—	—	—	—	—
Görlitz	—	—	—	—	—	—	—
Göttingen University Hospital ..	—	—	—	—	—	—	—
Kiel Workhouse Hospital	168	—	—	—	—	—	—
RUSSIA :							
Marie Hospital, Moscow	523	—	—	—	—	—	—
SS. Peter and Paul Hospital, St. Petersburg	371	—	—	—	—	—	—
Kalanga, Wooden Hospital	120	—	—	—	—	—	—

Published plans :—St. Gertrandt's : "Zeitschr. f. Bauwesen," Gerbkin, 1851. Görlitz : "Deutsch. Jahrb. ü. d. Leistungen und Fortschritte auf den Gebieten der Theorie und Praxis der Baugewerbe," 1873. Göttingen : "Notizblatt des Architekten für das Königreich Hannover." Kiel : "Allg. Bauzeitung," Förster, 1836. Kalanga-Zodtschy : "The St. Petersburg Art Technical Journal," 1872.

Colonial Hospitals.—Class 3, Sub-class 3B.

—	Total No. of Beds	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
VICTORIA, AUSTRALIA :							
General District Hospital, Sandhurst	150	—	—	—	—	—	2,904'00



CHAPTER IX.

CLASS 4.—IRREGULAR HOSPITALS.



ADELAIDE HOSPITAL, DUBLIN.—The building which formed the nucleus of the existing hospital was not built specially for the purpose, but was an existing fabric remodelled. As far as can be judged from the plan, it appears to have been an oblong block, to which have been added two wings and a large staircase; one wing which projects slightly in front of the main building, but has the same axis, contains board room and offices on the ground floor, and three floors of wards above; these wards are wide in proportion to their length, but are fairly supplied with through-ventilation. The other wing projects from the back of the main block at right angles, and is connected to it by a short corridor. It contains on the ground floor two small wards and the operation theatre, on the first floor a children's ward, and on the upper floors two pay wards. There is also a detached fever hospital.

Ancoats Hospital, Manchester.—The buildings here consist of: (1) an L-shaped block containing the administration offices and the out-patient department; (2) a straight block containing three floors of two wards each, and connected with the administration block by a corridor, off which are placed two isolation wards, the staircase and the operation room; and (3) a detached building containing the laundry, mortuary, &c. The site is a restricted one, and the most appears to have been made of it. The almost complete severance of the ward block from the administration is a commendable feature.

Bradford Infirmary.—The present building is the second since

the year 1835. The former hospital was opened in that year, but was found to be so unhealthy, chiefly on account of its defective construction, that it was deemed necessary to entirely reconstruct it, and the process of reconstruction was going on at the time of Dr. Bristowe and Mr. Holmes's visit. The building consists of a main block symmetrically planned, with a corridor running through its whole length. In the centre at the back is a projecting wing containing the staircase, with bath-room and store-room on ground floor, and operation room above. At each end there is a slight projection in front and a much greater projection behind. This part is divided by the corridor on the ground floor, but on the upper floor it forms at each end a long ward. From the east end of the main block the corridor continues to a long narrow block placed at right angles to the main block, and containing on the ground floor a series of small wards and four residents' rooms, and, on the floor above, one ward 123 ft. long, with the necessary offices. The corresponding building on the west side is the out-patient department with the nurses' quarters above. The laundry is a separate building.

Bristol General Hospital.—This, the smaller of the two hospitals at Bristol connected with the medical school, was erected in 1858. Roughly, it is in the form of the letter **J**, placed backwards. A corridor divides the upstroke and the greater part of the horizontal stroke longitudinally, and the wards are placed on each side of it. A prominent feature in the building is an octagonal tower, which occupies the outer angle. This is occupied by a committee-room on the ground floor and day-rooms above. The out-patient department is on the ground floor of the main building. The mortuary is detached. The following note in Dr. Bristowe and Mr. Holmes's report is of interest: "The ventilation and warming of the wards is assisted by an apparatus, consisting of a shaft in the garden from which air passes into the basement, where it is passed over a series of pipes heated with hot air into a chamber, and thence into each ward; at the upper parts of the wards there are shafts for the foul air, communicating with a tower, in which the air is raised by contact with heated flues, and thus drawn out of the wards. This system was originally intended to replace open windows and open fireplaces altogether; but after a short trial it was found that the hospital was becoming infected with erysipelas, and therefore, at the representation of the medical staff, the scheme was abandoned; at least it was only retained as an adjunct to the above-mentioned

more powerful agents, and an adjunct on which, if we understood rightly, they did not set much store."

Chester Infirmary.—This hospital was built in 1761, and is therefore for the most part an old building. The original plan was that of a fairly large open quadrangle surrounded by buildings, but encroachments have been made from time to time on the area of the quadrangle, so that it is now less than half its original dimensions. The building is four storeys in height, including a basement which is only partially occupied by the laundry and boiler-house. The ground floor contains the out-patients' department, kitchen offices, and residents' rooms. The first floor is occupied by wards and the operation room and chapel, and the second floor contains wards and dormitories for nurses and servants. None of the wards are cross-ventilated, and there is no other disconnection between the wards and the water-closets than the intervening corridor which gives access to all the wards.

Coventry and Warwick Hospital.—No information.

Durham County Hospital.—As originally designed, this hospital consisted of a symmetrically planned front block with its main front facing south-east, at the west angle an L-shaped wing projecting north-west from the front block, and then again in a south-westerly direction. Subsequent additions, consisting of a wing projecting from the north-east and of the main block at the back, and a building beyond, running parallel to the front block but not connected with the wings, convert what was originally open space into a quadrangle. The L-shaped wing referred to has also been enlarged to twice its original size and an operation room built out from the centre of the front block. The front block is traversed from end to end by a corridor, on each side of which the wards and other rooms are placed. The L-shaped wing forms on each floor one large wing, and in this instance only the water-closets are properly cut off from the wards. The detached building at the back contains the laundry and dormitories for servants above.

Essex and Colchester Hospital, Colchester.—This hospital was opened in 1820. It then consisted of a rectangular front block with three detached buildings arranged symmetrically, one on each side, and one at the end of a large enclosed courtyard. On one side was a brew-house and washhouse; on the other were the out-patients' waiting-room and surgery, surgeon's sitting-room and bedroom. At the end were the mortuary, open shed, dust-hole, coal and wood store. In 1839, wings were added to the east and west of

the front block, and in 1878 the ward offices (water-closets, sculleries, &c.) were placed in projecting buildings with cross-ventilated lobbies, the out-patient department was remodelled and much enlarged, the kitchen offices were built out at the back of the main block, and separated therefrom by a corridor with windows on both sides, and separation wards were built adjoining the washhouse. The mortuary also was removed to the south-east corner of the courtyard. The plan, as might be expected, shows some serious defects, notably in the ventilation and lighting of the larger wards, and in the position of the smaller wards (east and west wings), at right angles to the larger ones and leading out of them; but at the same time it must be admitted that the alterations of 1878 did much to improve the original faulty construction.

General Hospital, Birmingham.—It is typical of the remarkable growth of the town of Birmingham during the last century that in 1779, when the General Hospital was built, it was in the fields and quite outside the town. The original building consisted of one rectangular block of the usual kind with a central corridor and wards on each side; wards have been added to this block projecting from the back, and two long narrow wings at each end, so that the main block resembles a very wide H with irregular projections from the cross-piece. In addition to the main block there are three separate detached buildings, one being the home for nurses, another a small block of burn wards, and a third the mortuary.

General Hospital, Nottingham.—This is one of the main provincial hospitals erected towards the close of the last century, it having been built in 1781. The original building was like so many others of this period—a symmetrical block with a corridor running from end to end, with the wards arranged on each side. Additions have been made to this block from time to time, so that its appearance is now anything but symmetrical. One of these excrescences contains the chapel, with day-room underneath for men, and another a large irregular-shaped ward and the out-patient department. At the back of the latter is a detached laundry, and further away still is a building raised on piers and arches above the ground in order not to intercept the access of air to the front building. This building contains a large accident ward and nurses' rooms, and is connected to the main building by an elevated corridor. Detached a few feet from the main building at the chapel end is a fever hospital, built in 1829, and at the back of this is a laundry and dissecting-room.

Great Yarmouth Hospital.—This is quite a recent hospital, having been opened in 1888. The ground plan shows a long oblong block with several projecting portions. On the first floor, however, the building is broken up into three blocks—a central block with two wings, one at either end, connected with the central block by narrow corridors. The ground floor contains the administration offices, the out-patient department, and three small wards. The central block on the first floor contains two small wards, board-room, and two day-rooms, with bath-rooms, water-closets, &c., and the end wings are large wards. The central portion only has a second floor, which is wholly occupied by bedrooms for the staff. The small wards are all of them of an objectionable form and deficient in proper means of ventilation; while the large wards, though well isolated from the main block, are not good examples of a properly through-ventilated ward. Although the site is a confined one, it would have been possible to have placed upon it a building more in accordance with the advanced knowledge of hospital hygiene of the present day.

Guy's Hospital.—This, the second largest hospital in London, was founded in 1722 by Thomas Guy, a bookseller. According to Highmore ("Charities of London," 1814), the founding of the hospital was due to a very trivial circumstance. The story is that Guy, being a bachelor of thrifty habits, had engaged himself to marry his servant. Some days previous to the date fixed for the ceremony, he ordered the pavement in front of his house to be repaired as far as a certain point, which he marked. Having done this, he went away on business. The servant, seeing a broken stone beyond the limit marked by her master, told the masons to replace it. Guy, on his return, enraged at finding his orders exceeded, on learning the facts renounced his engagement, and devoted his fortune to public charity. Whether this tale be true or not, it is certain that five years before his death Thomas Guy determined to erect and endow a hospital at his own cost, and for that purpose rented a piece of ground from the governors of St. Thomas's Hospital, and immediately opposite that institution, for the term of 999 years, at the yearly rent of £30. The cost of erection amounted to £18,793 16s. 1d., and the sum left by will by the founder to endow the hospital was £219,499 os. 4d.*

The hospital grounds, bounded on the north by St. Thomas's Street, on the east by New Street and Great Maze Street, and on the

* Highmore, *op. cit.*

south and west by adjoining buildings, covers an area of $6\frac{1}{2}$ acres. There are five groups of buildings, consisting of (1) the old hospital, with the two wings added soon after Guy's death, (2) the new wing, or "Hunt's building," (3) clinical wards, (4) theatre, museum, lecture-rooms, and dissecting-room, and (5) Petersham dormitories, post-mortem room, mortuary, inquest room, and laundry. Guy's original building consisted of a square block of buildings, enclosing two quadrangles, the main entrance being in the centre of the north side. The two wings, which project from the north side and form two sides of the front quadrangle, in the midst of which stands the statue of the founder, were erected by the governors soon after the death of Guy. The left or east wing contains the house of the treasurer and that of the medical superintendent. The right or west wing contains the matron's and chaplain's houses, chapel, and part of the medical school. The block behind this (the original building) is almost entirely devoted to wards, which on the upper floors line the four sides of each quadrangle. The kitchen offices and stores are in the basement. The "new wing," or "Hunt's House," is a long rectangular building, with the entrance and main staircase in the centre. The ground floor is devoted to the out-patient department, ophthalmic wards, museums, and kitchen offices. The three upper floors are devoted to wards. The latter are arranged in pairs, as at the London Hospital, with a large day-room intervening between each set. The four corners of the day-room are occupied by two sister's rooms, a scullery, and a bath-room. This building is provided with an elaborate system of ventilation. The fresh air is taken in at the top of two towers and drawn down to the basement, where it is warmed and sent up to the wards, and admitted at the floor level, and the foul air is extracted from the ceiling level and drawn off through shafts to the top of a lofty tower by means of heat. The system has been anything but a success, and in the report of Dr. Bristowe and Mr. Holmes is said to be "condemned unanimously by the medical staff, who find it utterly inefficient, and who regard these wards as the least healthy in the hospital." The detached building, containing clinical wards, was formerly devoted to the treatment of lunatic patients. The wards are cross-ventilated, but the roofs are supported by two rows of iron columns. The latter arrangement does not, however, prevent these wards from being of a very cheerful appearance. In connection with this block are a laboratory and the electric department. The Petersham dormitory is chiefly devoted

to surgical cases, and is three storeys in height. The medical school is rather scattered. Part is in the front main block of buildings, part in "Hunt's House," and part forms the detached building already referred to.

Halifax Infirmary.—No information.*

Hereford General Infirmary.—This hospital was established about the year 1776, but has been much added to since it was first opened. The plan of the building is irregular and can only be described as a series of parallelograms of varying sizes joined together into one irregular block.

The Infirmary, Kilmarnock.—The buildings which form this hospital are three in number : (1) a main front block, which is a long rectangular block with the ends projecting slightly ; in this block are the principal sick wards ; (2) a smaller block behind this, and with its longer axis at an acute angle to that of the front block, from which it is distant at one angle only a few feet ; this block contains the kitchen offices, nurses' rooms, and a few small wards ; and (3) a separate and detached fever hospital. The fever hospital is served from the same kitchen as the general hospital, and communication between the kitchen and the fever wards is by a covered way. The food is handed in at a window. In the main block are two rooms for paying patients. Besides the buildings named above, there is a detached laundry.

Kent and Canterbury Hospital.—The plan of this hospital resembles the letter **E** with the centre stroke eliminated. The oldest part dates from the year 1793, additions having been made in 1838 and in 1870. With the exception of one small ward the ground floor is occupied entirely with administration offices. The central part of the first floor is taken up by three long wards the whole width of the building, and all communicating. The wings contain the two staircases, two small wards, and each a larger ward ; the latter occupy the two projecting portions, and in these cases the wards have through-ventilation, and the water-closets are built out in projecting towers with through-ventilated lobbies. The second floor contains the operation room, three small wards, day-rooms, two isolation wards and dormitories for nurses and servants.

Leith Hospital.—On a triangular-shaped site are two blocks connected together by a corridor. One block is square, with a projection at the back : this is the old part of the hospital, and contains the administration offices and the general wards. The

* In course of reconstruction on a new site.

staircase occupies the centre, and the wards are placed around it. The other block consists of two parts—a square block containing rooms for the staff, and a long and narrow wing projecting from the square block at an acute angle, and containing the operation room and fever wards. The latter are approached by a separate corridor, but appear to be in atmospheric communication with the operation room and the front block.

The Metropolitan Hospital (late "Metropolitan Free").—

This hospital was originally established in Bishopsgate, but was in 1884 removed to its present site in the Kingsland Road. It consists of an administration block, two ward blocks, and an out-patient department. The administration block is six storeys in height, and contains all the administrative offices and residences for the staff. The communication between this block and the other three is by means of covered bridges. The larger ward block contains four floors of wards, with a ward kitchen and nurse's room on each floor. The water-closets and bath-rooms are placed in towers projected from the angles of the wards and connected therewith by covered-in bridges, with an open air-space between the bridge of one floor and that of the floor above. The smaller ward block contains on the ground floor two accident wards, and a ward for twelve beds on each of the upper floors. The out-patient department is on the basement level, and is one storey only in height. The mortuary and post-mortem room occupy the corner of the site furthest removed from the wards. The plans show a strange deficiency in proper conveniences for the staff: one bath-room has apparently to serve for both medical and nursing staff and servants, and no water-closets appear to be provided for the staff except those adjoining the wards. The accommodation for nursing staff appears to be very meagre, and the objectionable plan of coupled beds is adopted in the wards.

Montrose Royal Infirmary is a building in the form of a T with administration offices in the centre and wards in the arms. The building is well placed, and for an essentially country hospital appears to serve its purpose well.

Northern Hospital, Liverpool.—Unlike many of the foregoing which are essentially country hospitals, the present is a specially town hospital; and also it is specially a surgical hospital, placed intentionally in close proximity to the docks and large works. Its laws provide that accidents and acute cases shall have the first claim to its care. Accordingly we find the site a very confined one,

hemmed in by buildings and close to the Mersey and to a most densely populated quarter. The building is in the form of a T, and the wards are all entered from central corridors. The sanitary condition of the hospital was in 1882 examined by the late Professor de Chaumont, who reported that the general plan of the building was bad, particularly in respect of the inter-communication existing between all the wards and rooms through the passages and staircases, in the insufficient ventilation and faulty arrangement of the wards, in the position of the water-closets, and in the system of drainage. Whether any improvements were effected in consequence of Professor de Chaumont's report the information supplied does not say.

Poplar Hospital for Accidents, London.—In 1853 a building, formerly used as a custom house, was opened for the reception of accidents, mainly with a view to providing for the needs of seamen in the neighbouring docks of the East and West India Dock Company. A small addition was made in 1883, but the hospital is still practically a converted house, and presents no special features of interest.

Radcliffe Infirmary, Oxford.—This hospital dates from the latter half of the last century, the oldest portion having been erected in 1770. The buildings now consist of (1) the hospital proper, including a wing containing the out-patient department, one containing a surgical ward, a third containing the chapel, and a fourth wards for women; (2) the children's hospital; (3) fever wards; (4) laundry; and (5) mortuary. The old main building consists of a rectangular block with wings at each end projecting slightly back and front, the longer axis of the building being about N.W. by S.E. This block is divided by a corridor, on each side of which the wards and other rooms are placed. The surgical ward projects to the S.W. and the out-patient department to the N.E. At the other end of the block a corridor running N.E. gives access to the chapel, and another corridor running for a considerable distance to the S.W., and then turning at right angles, connects the women's wards, a building in the form of a Latin cross, with the main block. The children's hospital, the fever wards, and the laundry are all detached buildings. This hospital was in 1874 the subject of an investigation by Mr. Netten Radcliffe into the causes of a then recent prevalence of erysipelas, and his report* is a

* *Sixth Annual Report of the Medical Officer of the Local Government Board*, 1876-77 (Supplement).

very instructive one. The accident ward (now called surgical ward) was the principal part of the hospital affected. Besides very faulty conditions of drains, Mr. Radcliffe found in the warming arrangements a special and remarkable condition of danger. This ward was warmed by a hot-air shaft passing longitudinally under the centre of the ward and having openings at intervals. Not only was this shaft never cleansed, but the air supplied to it from the outside came from a position directly opposite the laundry door,* only 12 ft. distant, and at which particular spot the baskets containing foul linen were habitually placed. Another source of infection was traced to the practice of screening refuse immediately beneath the windows of the accident ward.

Royal Cornwall Infirmary, Truro.—The date of this hospital is 1799, since which it has twice, in 1853 and again in 1868, received additions. The original building evidently consisted of a long straight block with a small wing projecting behind ; a second wing has been added to one end of the front block and a third L-shaped wing with a second staircase has been added to the original back wing of the main building, the result being a building of most irregular form. The greater part of the building is three storeys high in addition to the basement. The whole of the basement floor is devoted to kitchen offices, stores, and laundry, with the dead-house under a portion of the front wing. The approach to the dead-house is through a lumber-room, which opens into the yard, but the latter also communicates with a room in which is a lift which communicates with the ward scullery on the ground floor. Free connection is, therefore, established between the interior of this wing and the dead-house. The ground floor contains the main entrance rooms for resident staff, accident ward, and small ward adjoining—nurse's room out of last only accessible by passing through both wards, contagious ward with "spare room," nurse's bedroom, water-closets, bath-room and kitchen. The last-named ward, and its appurtenances, are all in the front wing and do not communicate with the rest of the hospital, the entrance being direct from the open air. The water-closets are all more or less in direct communication with the wards, that to the accident ward leading out therefrom. The first floor contains wards of varying sizes, a large nurses' dormitory, through which, or through a ward, it is necessary to pass in order to reach one of the small wards, and a

* This laundry has since been disused and a new one built at a considerable distance from the wards.

large board room, also used as chapel. The second floor contains wards, operation room, and servants' dormitory. This hospital appears to be particularly well off in the matter of grounds.

Royal Infirmary, Aberdeen.—This hospital has recently been reconstructed. The old building is a block in the form of an H, with wards in the central part on each side of a corridor and in the projecting wings. The shape of the site is that of an acute-angled triangle, with one of its angles slightly truncated and another rounded off. The old block occupies the base, and the new buildings are placed one on each side with a small block at the apex. The larger of the two ward blocks is a long narrow building bent to follow the shape of the site, and is to be devoted to surgical and eye wards. It is three storeys in height, and the whole building communicates from end to end. It will, therefore, be possible to pass from the female surgical ward through the male surgical ward, and the male eye ward to the female eye ward; the male and female wards being in each case separated by the interposition of staircases, separation wards, duty-rooms, lifts, &c. The Committee contemplate making alterations in the smaller ward block plans, as at present arranged. This block is partly three storeys, partly four storeys in height, and is to be devoted to medical cases. The central part (the four-storey portion) contains separation wards, duty-rooms, bath-rooms, &c., and the wings contain the wards. The small building at the apex of the site contains the mortuary, pathological museum, and post-mortem theatre. The old front block is to be entirely devoted to administrative and teaching purposes only.

Royal Infirmary, Glasgow.—This large and important hospital comprises four separate blocks; in addition to which there is a large medical school and a laundry, both detached and at some distance from the main buildings. The main front building is the oldest portion, having been erected in 1794. It is now in the form of a **⊥**, with the entrance in the centre, the back or north wing having been added in 1816. This building is five storeys in height, and is called the medical house; each arm of the **⊥** contains wards which have through-ventilation. The central portion is devoted to officers' rooms, &c. A one-storey addition to the back wing contains dining-room and reading-room for assistant medical officers. The centre of the front portion is surmounted by a dome, which now forms part of the chapel, but was originally the operation theatre, and contained seats for 200 students. Projecting from the back of the left wing is a long annexe containing the main kitchen, a self-contained

house for the superintendent, nurses quarters, receiving-rooms and gate-house. In the corresponding position at the back of the right wing, but not attached thereto, are the museum and post-mortem room in a one-storey building. Beyond this comes the old surgical house, formerly fever wards. This is an oblong building divided into two parts by the staircase and some small rooms; the wards are cross-ventilated, and open one out of the other. At right angles to the latter building, and forming one side of the large quadrangle, is the new surgical house, erected in 1861—a lofty building four storeys in height, in addition to the basement. It contains, besides the general wards, several wards for private patients, a day-room on each floor, and an operation theatre capable of accommodating 200 students.

Royal Portsmouth, Portsea, and Gosport Hospital, Portsea.

—This hospital consists of two parts: a general hospital supported by voluntary contributions, and a female lock hospital supported by Government. The building is a large and straggling one, and has more the appearance of a large private house than of a hospital. The wards vary in size, but the majority are small. There is a detached block containing two children's wards.

Royal United Hospital, Bath.—This hospital stands on a site triangular in form but with its base curved inwards, making roughly an obtuse angle round which the building is bent. It is bounded on all sides by streets, so that, though small in area, it is fairly open. The buildings consist of a main block forming the base of the triangle bent as described above, and a smaller block containing the mortuary and post-mortem room (one storey) and rooms for house surgeon and physician (two storeys). This block is connected with the main block by a one-storey corridor. The wards in the main block are with one exception (which has through-ventilation) of the ordinary corridor type.

St. Bartholomew's, Chatham.—This hospital, erected in 1862, consists of five separate buildings, three of which are connected together by covered ways. The front or largest block is a long narrow rectangle with slight projections on each side. It contains a number of wards, most of which are entered from corridors; in one case, at the south-east extremity what would otherwise be an ordinary through-ventilated ward is divided into two narrow wards ventilated on one side only. In 1863, when Mr. Timothy Holmes visited this hospital, he noted that the plan was confused and the rooms "all up and down little flights of stairs—never on the same

level." The defect of levels seems to have been remedied, but the plan is, if anything, more confused than when Mr. Holmes made his inspection. The detached buildings consist of the old out-patient department, now used as operation-theatre, with adjacent rooms, the out-patient department and two laundries.

St. Mary's Hospital, Paddington.—The youngest of the large teaching hospitals of London was founded in 1845 as the "Marylebone and Paddington Hospital." The buildings are three in number : the hospital proper, the out-patients' department, and the medical school, the latter being practically a detached building. The hospital building is in the form of a \perp , with a cross-piece at the end of the up-stroke. There are five floors, including the basement, with one additional floor in the Mary Stanford wing (the cross-piece referred to). The basement of the front block contains dispensary and laboratory, stores, and bed- and sitting-rooms for servants ; the back part contains the kitchen offices and laundry, and the Mary Stanford wing contains the library, luncheon-room, and students' common-room. On the ground floor of the front block are the offices and board-room, casualty-rooms, and medical officers' quarters. The back portion contains two wards, one beyond the other. The first is the accident ward—38 ft. 6 in. long by 51 ft. 6 in. wide—divided down the centre by a dwarf partition, on each side of which are two rows of beds, making in all four rows between the opposite windows ; the ward adjoining is the same width, but only 28 ft. long. It will be seen, therefore, that in these two wards the ordinary conditions are reversed ; that is to say, the windows are placed on the shorter length of wall instead of being on the longer. Between this block and the Mary Stanford wing is a staircase and a sisters' sitting-room. The Mary Stanford wing contains on this floor a ward for twenty-two beds, with a verandah on the south-west side. The first and second floors contain wards of varying sizes placed side by side, and in no case cross-ventilated. At each angle of the building is a tower containing water-closets and ward sculleries cut off from the wards by cross-ventilated lobbies. The main staircase occupies a very large space in the centre of the block. The back part is, on these floors, divided longitudinally by a corridor, on each side of which are two wards. The Mary Stanford wing is, on the first floor, divided into two parts by a corridor, one half being the chapel, the other a children's ward. The second floor of this wing contains two wards, one for eleven and the other for twelve patients. The third floor

contains nurses' bedrooms and sitting-room, and the fourth floor four isolation wards with offices. The history of St. Mary's Hospital affords some instructive lessons in ventilation. In their report on this hospital (*op. cit.*, p. 587), Dr. Bristowe and Mr. Holmes referred to the existence of a central shaft for extracting the foul air from the wards, in which a fire was always kept burning. They said "the secretary informed us, however, that there was reason to suppose the whole apparatus is a failure; that Dr. Sanderson had made numerous experiments which led him to the conclusion that the orifices of exit in the wards act little, if at all, and very often admit air instead of carrying it off, and that there is, in fact, rather a circulation of air in the shaft than an escape of air from it." In summing up their conclusions these gentlemen said: "The hospital cannot certainly be regarded as a healthy one, for most of the diseases which constitute unhealthiness in a hospital seem to prevail in an unusual degree, and there seems also to be considerable spread of infectious fevers. The wards are lofty and clean, the operation cases seem comparatively few, and no larger proportion of acute cases appears to be received than in other London hospitals. The explanation seems to be that the ventilation is, from the construction of the hospital, necessarily imperfect. The plan on which the hospital is built is, we think, defective. The wards, with one exception,* have windows on one side only; they communicate with one another, and, indeed, appear to have all the defects of the corridor system of building, without the advantage of the corridor itself." This was in 1863. In 1875 the state of the wards had become so defective that the committee requested Professor de Chaumont to investigate the causes with a view to providing a remedy. The main defects pointed out by Dr. de Chaumont were the deficiency of fresh air supply, and of the means of extracting foul air, and the fouling of the air from various sources, notably the laundry, the ward water-closets, and the dust-bin. In compliance with the recommendations of Dr. de Chaumont, several structural alterations were made, and the ventilation of the wards was improved by the addition of Tobin tubes. The result seems to have been fairly satisfactory. Finally, in 1887, the drainage system was entirely reorganised under Mr. Stephen Salter, acting in conjunction with Mr. Shirley Murphy, the lecturer on hygiene.

Salford Royal Hospital.—Founded in 1829, this hospital was

* The accident ward. At the time this was written, the Mary Stanford wing did not exist.

very considerably enlarged in 1866. The original building consisted of a single block of irregular shape, and had wards of the corridor type. In the enlarged building the plan takes roughly the form of an L, while in the basement the area of the site is almost entirely covered by buildings. The out-patient department occupies a one-storey wing on the basement level, and consists of a central waiting-hall with examining- and consulting-rooms on two sides. The water-closets for patients are in too close communication with the waiting-hall. The rest of the basement is occupied by the surgeons' rooms, accident and splint rooms, and the domestic offices and stores. A detached building contains a washhouse and laundry, and a mortuary and post-mortem room. Above the basement the plan takes, as has been said, the form of an L. The main entrance is at the centre of the lower and shorter limb of the L and the long up-stroke abuts on the left side on a street, the site being situated at the junction of three streets. The front or entrance building consists of a centre and two wings, the whole of the centre and the right-hand wing are occupied by the residential quarters for the medical and nursing staff and the servants. The left-hand wing contains wards which are approached by a corridor leading out from the centre of the central block, and joining two cross corridors which connect it with the wards. The wards are, considering the nature of the site, fairly well provided with cross-ventilation, and the water-closets are all effectually disconnected from the wards.

Salisbury Infirmary.—The original building, erected in 1766, consists of a square block, four floors in height. Wings have been added to this to the east, and then to the east of that again, to the west and to the south-west, until the ground plan is a straggling irregular block of no form that can be described. There is a detached laundry. In the old part there is a central hall extending up to the roof, with wards and other rooms on all sides. The large wards are 20 ft. high, and in the Report of 1863 (*op. cit.*), the cubic space per bed was stated to be 1,600 ft. If this is still the case, the floor space per bed can only be 80 ft., or a very little more than is allowed in a workhouse. The administration of this old hospital under Miss Carvasso (1892) is excellent.

Sheffield Public Hospital.—This hospital was established in 1832 as a dispensary only; in 1858 it was remodelled and extended, and provision was made for 61 in-patients, and in 1868 two wings were added, bringing up the total number of beds to 105. The

plan consists of an oblong block with two quadrangles ; one at the entrance enclosed on three sides only, and one at the back entirely enclosed. The main wards are ventilated into these two courts. The out-patient department is on the ground floor of the main block, and the kitchen is in the basement under the enclosed quadrangle. There is a detached mortuary, and some old cottages on the site are utilised as bedrooms for nurses and servants.

Sussex County Hospital, Brighton.—The original building of this hospital was erected by Sir Charles Barry, R.A., in 1828, and was a symmetrically planned rectangular block with central corridor having a south aspect. The first additions were wings at each end of this block, containing each a long ward with windows at one end and one side. On the west side another long ward, partly through-ventilated, and with staircase, scullery, &c. and nurses' rooms connecting it to the main block, was then erected ; and at the same time a small L-shaped wing was built at the east end. On the north a chapel forms another projection from the main building. Separate and detached buildings contain respectively (1) wards for special cases, (2) museum and mortuary, and (3) laundry, connected by subway with main building.

Taunton and Somerset Hospital.—This is another example of a provincial hospital erected at the beginning of this century, and added to on at least six subsequent occasions. The central block contains the administration offices, whilst the wings on either side contain two wards each. These wards are long and narrow, being 88 ft. in length by only 22 ft. in width, and for rather more than half their length they have no cross-ventilation at all. On one side, that nearest the central block, there are no less than nine beds with no intervening windows. The out-patient department is on the ground floor of a wing which, on the upper floor, is occupied by the Jubilee Nursing Institute. At the back of the main building is a small structure containing two convalescent rooms. The laundry and mortuary are separate detached buildings.

Warneford Hospital, Leamington.—This hospital, established in 1832 and considerably added to subsequently, consists of five separate blocks—the main block, or hospital proper, the out-patient department, a nursing home, fever wards, and the laundry. The site is a spacious one, and the fever wards are well isolated from the rest of the buildings. The main block is an irregularly shaped building, with the central portion three storeys high, and wings of two storeys. The wards are, for the most part, long and narrow, and

without through-ventilation, except in the accident ward and children's ward over. There is on the ground floor a large and well-ordered chapel. The matron's bed- and sitting-room (combined) is an enormous room for the purpose (24 ft. by 19 ft.). It has the exceptional advantage, due to its having formerly been a ward, of having a separate bath-room and water-closet attached. The out-patient department is separated from the main block by a passage-way, and is a one-storey building. The nurses' home is a building originally destined for infectious cases, but serves its present purpose admirably. The fever wards, "Herbert Beaumont Cottage Hospital," is a one-storey building containing two wards and the necessary offices. The necessity for through-ventilation has been needlessly ignored, and the building itself is built in too flimsy a style. The walls are only 9 in. thick. This is not a sufficient thickness even when the best bricks are available, but when the inferior bricks of the Leamington district are used a wall of that thickness is far too thin to withstand the weather. Notwithstanding these faults, this hospital must be regarded as a very suitable one for the wants of the town, and, indeed, in some respects is exceptionally well found.*

West London Hospital, Hammersmith.—This hospital was erected in 1871. It occupies a small site on the Hammersmith Road, bounded on two sides by adjoining buildings, and on the other sides by the Hammersmith Road and Elm Grove. The building is, roughly, L-shaped, with the horizontal stroke facing the main road. The front portion contains the principal entrance and wards; the back portion contains the out-patient department, with resident officers' rooms over. Two detached one-storey buildings contain respectively a laboratory and class-rooms, and the mortuary, post-mortem room, and pathologist's room. The main building is crowded and ill considered. In only one instance is there any cross-ventilation worth the name to the wards. The water-closets are all in direct communication with the wards. Nurses' bed- and sitting-rooms (combined) are placed at the extreme ends of wards, accessible only by passing through the whole length of the wards, and the out-patient department, which might well have been isolated from the hospital proper, is in direct communication with it.

* This hospital has recently been added to and partly remodelled from the designs of Mr. Keith Young, F.R.I.B.A. Two pavilions of wards with an isolated operation-room are being erected, and extensive additions are being made to the nurses' home.

British Hospitals.—Class 4.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Poplar (Accidents)	50	8'00	56'42	—	—	—	—
St. Mary's London	200	9'50	115'00	18'50	2,128'50	16'58	305'00
West London	102	{ 8'00 6'00 }	66'26	14'00	927'64	18'66	156'58
Guy's, Old	600	{ 9'66 11'33 }	116'81	12'00	1,401'72	26'65	471'90
" New		{ 11'33 9'50 }	114'45	14'00	1,602'30	41'30	
Metropolitan	160	{ 9'50 5'25 }	96'00	13'00	1,248'00	24'93	130'50
Chester	150	5'50	79'72	9'50	757'34	13'85	1,671'36
Stockport	60	8'00	98'00	12'00	1,176'00	21'33	1,452'00
Royal Cornwall, Truro	50	7'00	78'00	14'00	1,092'00	13'41	1,742'40
Durham	70	—	—	—	—	—	933'42
Essex and Colchester	90	5'50	82'34	13'18	1,085'24	16'95	1,452'00
Bristol General	154	6'00	84'61	15'00	1,269'15	15'23	146'10
Portsmouth	70	—	—	—	—	—	—
Hereford	100	8'00	—	—	—	—	150'00
Kent and Canterbury	102	7'00	82'80	14'00	1,159'20	28'00	1,562'35
St. Bartholomew's, Chatham	42	8'00	106'10	14'50	1,538'45	17'20	1,296'42
Liverpool, Northern	154	{ 136'00 72'33 }	—	11'00	{ 1,496'00 179'63 }	—	149'26
Nottingham	\$180	8'00	120'00	16'00	1,920'00	29'00	\$605'00
Oxford, Radcliffe	135	8'00	150'00	15'00	2,250'00	36'33	1,613'33
Bath United	120	6'83	96'31	13'91	1,339'67	32'12	777'85
Sussex County, Brighton	173	7'00	90'85	13'00	1,181'05	11'07	1,303'02
Birmingham General	280	10'00	106'19	16'58	1,760'63	33'18	777'85
Coventry and Warwick	60	7'00	113'50	18'00	2,043'72	20'13	\$1,452'00
Leamington, Warneford	110	6'25	81'70	11'66	952'62	11'00	1,188'00
Salisbury	106	8'50	133'63	14'58	1,948'32	25'78	1,335'56
Bradford	210	6'50	81'00	14'50	1,174'50	—	—
Halifax	100	—	—	—	—	—	—
Sheffield Public	105	6'00	83'85	15'50	1,299'67	17'60	171'42
Aberdeen, Royal, Old	†233	6'41	58'26	14'00	815'64	11'16	—
" " New	—	—	—	—	—	—	—
Kilmarnock	108	7'75	81'50	16'00	1,304'00	29'75	\$1,117'40
Leith	82	10'75	109'50	15'50	1,697'25	37'50	330'80
Glasgow Royal Infirmary	542	{ M. 6'00 S. 7'66 }	{ 54'54 57'94 }	{ 11'75 14'00 }	{ 640'84 991'16 }	{ 7'84 16'41 }	803'69
Perth County	104	—	—	—	—	—	—
Dublin Adelaide	125	—	84'86	13'66	1,159'18	—	—
Great Yarmouth	40	6'66	80'00	12'25	980'00	22'29	438'75
Montrose	80	—	—	14'00	*730'00	—	—
Ancoats, Manchester	††37	5'83	63'75	11'00	701'25	8'59	486'48
Taunton and Somerset	100	6'00	92'00	13'00	1,196'00	17'38	†1480'00
Salford	60	—	—	—	—	—	—

* Coupled beds. † Highest. ‡ Lowest. § Approximate.
 ¶ These figures refer to new wards only. ¶ In process of enlargement: figures refer to old part only.
 ** Bristowe and Holmes. †† About to be considerably enlarged.
 ‡‡ Includes garden on opposite side of road.
 Published plans:—St. Mary's: Oppert, Bristowe and Holmes. Guy's: Oppert. Bristol General: Bristowe and Holmes. Kent and Canterbury: Bristowe and Holmes. St. Bartholomew's, Chatham: Bristowe and Holmes. Radcliffe, Oxford: Oppert, Bristowe and Holmes. Bradford: Oppert. Sheffield: Bristowe and Holmes. Oppert, Aberdeen: Oppert, Bristowe and Holmes. Glasgow: Oppert, Bristowe and Holmes.

Colonial Hospitals.—Class 4.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Toronto, General Hospital	340	—	—	—	—	—	781'25
*Gibraltar, Civil Hospital	89	7'00	94'00	15'50	1,457'00	14'25	—

* Partly pavilion type.

Foreign Hospitals.—Class 4.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
AUSTRIA-HUNGARY.							
Vienna, Great Hospital	2,000	—	—	—	—	—	—
FRANCE.							
St. Antoine, Paris	677	—	—	—	1,288'10	—	—
Cochin, Paris	386	—	98'05	18'04	788'32	—	—
Hôpital Hospice, Angers	—	—	—	—	—	—	—
Hôpital de Dijon	—	—	—	—	—	—	—
La Charité, Paris	516	—	—	—	—	—	—
La Pitié, Paris	709	—	—	—	—	—	—
St. Louis, Paris.. ..	—	—	—	—	—	—	—
GERMAN EMPIRE.							
Clinical Hospital, Bonn	180	—	—	—	—	—	—
Charité, Berlin	*500	—	—	—	—	—	—
Civil Hospital, Strassburg	1,600	—	—	—	—	—	—
Ducal Hospital, Brunswick	—	—	—	—	—	—	—
Borough Hospital, Freiburg	—	—	—	—	—	—	—
Hamburg General (Old)	1,600	—	—	—	—	—	—
ITALY.							
Milan Ospedale Maggiore	3,400	—	—	†30 to 40	†2,000'00	—	—
Milan, Ospedale Fatebene Sorelle	—	—	—	—	—	—	—
Rome, San Spirito (Males only)	1,016	—	—	—	—	—	—
Turin, St. Louis of Gonzaga.. ..	120	—	—	—	—	—	—
Turin, S. Giovanni Battista	600	—	—	—	—	—	—
Genoa, Ospedale Grande	—	—	—	—	—	—	—
Florence, Sta Maria Nuova	1,200	—	—	—	—	—	—
Florence, St. John de Dieu	—	—	—	—	—	—	—
Naples, St. Janvier	—	—	—	—	—	—	—
Novara	400	—	—	—	—	—	—
Pisa, St. Matthew's Hospital	—	—	—	—	—	—	—
RUSSIA.							
Obrichoff Hospital, St. Petersburg	—	—	—	—	—	—	—
Alexander Hospital, St. Petersburg	—	—	—	—	—	—	—
St. Mary Magdalene, St. Petersburg	200	—	—	—	—	—	—
SPAIN.							
Madrid, General Hospital	1,600	—	—	—	—	—	—
Madrid, La Latina	—	—	—	—	—	—	—
Santa Cruz, Old Hospital	—	—	—	—	—	—	—
SWEDEN.							
Riga Hospital, Stockholm	—	—	—	—	—	—	—
Provincial Hospital, Söderköping	56	—	70'00	12'00	840'00	—	1,555'71
Hospital at Vimmerby.. ..	—	—	—	—	—	—	—

* No. of beds, according to Oppert, 1,300.

† Main wards *cf.* Oppert.

Published plans:—St. Antoine, Cochin, Angers, St. Louis: Husson, "Revue Générale de l'Architecture," 1841. Brunswick: "Grundriss Vorbilder," Klasen. Charité, Berlin: Oppert. Hamburg: Oppert. Milan, Grand Hospital: Husson, L. Runge, "Beiträge zur Kenntniss des Backsteins," Berlin, 1853; "Zeitschr. f. Bauwesen," Berlin, 1851. Rome: Letarouilly, "Edifices de Rome moderne," Turin, St. Louis: "Zeitschrift für Bauwesen," Erkbau, 1851; "Revue Générale de l'Architecture," Paris, 1841. Florence: "Architecture Toscane," 1815. Naples, Novara and Pisa: "Revue Générale." Madrid, General Hospital: "Revue Générale de l'Architecture," 1841. La Latina: "Monumentos Arquitectónicos de España." Santa Cruz: *Ibid.*



CHAPTER X.

HOSPITALS AND DISPENSARIES OF BRITISH INDIA.

IN 1859-60 there were not more than 181 hospitals and dispensaries in India, treating some 111,000 patients. From the records of 1889-90 it appears that the number of institutions had increased to 1,642, treating 265,000 indoor and 11,978,000 outdoor patients. There were also 25 lunatic asylums containing 4,976 inmates, and 23 leper hospitals. These figures do not include the hospitals of the Native States, in most of which there is at least one dispensary, and in many there are several. In connection with this object it must not be forgotten that, under the exertions of the Marchioness of Dufferin, aided by Lady Reay, Lady Lyall, and others, women's hospitals or dispensaries have been established at many places, and lady doctors, midwives, and female nurses have been supplied.

From the last report of the "National Association for Supplying Medical Aid to the Women of India," it appears that there are forty-eight female hospitals or dispensaries in operation, nine being in the Native States. There were healed at these institutions in 1890 412,591 females, including 51,973 in the hospitals of the Native States. It must not, however, be understood that formerly no women were treated in Indian hospitals, for the number of females in most hospitals was only limited by the number of beds available. But the female hospitals and lady doctors reach a class of Indian women who were by social custom and caste unable to avail themselves of the existing means of relief in sickness.

No two hospitals in India, and not very many dispensaries, are constructed on the same plan. The varying ideas regarding the

proper construction of hospitals—considerations of space, want of pecuniary means, deference to social customs and caste—have all combined to render it imperatively necessary to do the best that could be done, even though the result be not to accomplish everything which should be done. Many of the dispensaries, in fact, were formerly merely dwelling-houses or other buildings, which have been utilised for sick relief.

The ideal hospital for India is a central administrative block with cottage hospitals scattered about the grounds, for the distinctive castes of patients, so that social prejudices may be respected as far as possible. A nurse should be in charge of each block, and there should be space for one female for every three to four men. Considerations of space, however, generally forbid any such arrangement.

The civil hospitals and dispensaries are divided into classes, not in relation to size, or number of patients, but with reference to the manner in which they are supported :—

Class 1.—State.

Class 2.—District Board, Municipal, &c.

Class 3A.—Private.

Class 3B.—State-aided.

The number of dispensaries of the different classes varies, of course, in different provinces. All the dispensaries and hospitals mentioned in the official reports are under the inspection and control of the Medical Department. But there are other private dispensaries which are not under the medical department. The following may be accepted as fair examples of the hospitals and dispensaries in British India under the control of the Medical Department :—

Borsad Dispensary, Kaira Collectorate, Bombay Presidency.—The Borsad Dispensary is a new building, giving accommodation for eight male and four female patients. There are also a special ward, a surgery, and a dispensary, with bath-rooms and spacious verandahs. Out-houses consist of medical officer's quarters, latrines, and cook-house. From a recent report it appears that 4,079 outdoor patients and 245 indoor patients were treated in this dispensary during the year 1890.

Bulrampur Hospital, Lucknow, Oude.—This is a handsome building, affording a central hall faced by a portico and backed by a verandah. On either side of the central hall are the different offices, adjoining which are two large wards 67 ft. by 22 ft. In *échelon* to these, but connected by verandahs, are, on the right, a ward 22 ft.

by 25 ft., and two others 22 ft. by 10 ft. each. On the left, there is a large ward 37 ft. by 22 ft. and a smaller ward 22 ft. by 10 ft. Baths, washhouses, &c. are at the extreme angles. Detached are good quarters for the medical officer. The most recent report of this hospital gives 1,106 indoor and 27,895 outdoor as the number of patients.

The Cama Hospital for Females, Bombay.—This hospital was built by the liberality of Sir Pestonjee Hormusjee Cama. The foundation stone was laid by H.R.H. the Duke of Connaught in November 1883, and the hospital was opened by Lord Reay, the then Governor of the Presidency of Bombay, in 1886. It is located in an excellent position on the Esplanade, and is a handsome three-storey building. The ground storey consists of central hall, two wards for ten patients each, a labour ward, dispensary, class-room, and assistant matron's quarters. At each extremity there are pavilions connected by covered ways, 16 ft. by 16 ft. The second floor consists of wards, children's ward, operation room, and matron's quarters. Above, in the centre, are quarters for the resident surgeon. In the ground attached to the hospital, in addition to servants' quarters and the necessary out-houses, there are a ward for infectious cases and quarters for probationers desirous of learning nursing. The hospital since its commencement has been under the control of Dr. Edith Peechy-Phipson, assisted by three other lady doctors. According to the last report available (1890) there were 808 indoor patients and 8,207 outdoor patients during the year. It should be mentioned, that the dispensary for outdoor patients is in separate ground some little distance from the hospital. The Cama Hospital is in connection with Lady Dufferin's Fund, and received much support from Lady Reay when Lord Reay was Governor of Bombay.

The Campbell Hospital, Sealdah, Calcutta.—This hospital was initiated during the period Sir George Campbell was Lieutenant-Governor of Bengal. It consists essentially of two long wards, having, connected by a covered passage, the dispensary and the superintendent's office. There is a second floor over part of the building, which is used for patients. Detached, at some distance from the main building, there is what is termed "the ward for worst cases." This consists of one long ward surrounded by a verandah, and ventilated and lighted by skylights. There is also another detached building which is used as a small-pox hospital, and has its separate cook-house and latrines. During 1890, 8,415 indoor

patients were received in this institution. But, as many of these patients were practically moribund when admitted, the mortality at this hospital is always high. In 1890 it was 202·27 per mille. The place is really a lazaretto and not a hospital. Recently, considerable improvement has been effected by raising and draining the ground in the immediate locality, which formerly became flooded during the rainy season. An outdoor dispensary is much needed, and it is believed the provision of such addition is now sanctioned. There is a medical school attached to this hospital for which are provided two lecture-rooms, a dissecting-room, and an assistant surgeon's residence. Students are here educated for the subordinate branches of the medical departments, or to become private practitioners. The last available report gives the number of students at this school as 220 male and 14 female.

Cawnpoor Dispensary, North-West Provinces.—This dispensary consists of entrance porch, a dispensary and waiting-room, and an examination-room in the centre. To the right are a store-room, a special ward for eye cases, and a small ward for Europeans. To the left there is a ward 37 ft. by 20 ft., used for surgical cases. The whole is surrounded by a ward verandah, having bath-rooms at the rear angles. The upper storey is divided between two wards, one for males and one for females. There are a detached cholera ward, latrines, servants' quarters, and dead-house. A private ward for four female patients has recently been completed. The last available report gives 1,383 indoor and 21,431 outdoor patients during the year.

Civil Hospital, Colombo.—The main portion of this hospital was built in 1863, and has been added to from time to time. All the buildings are one storey only. Commencing in front, there is a separate building, the dispensary. From this a covered way leads to a building divided into four wards, viz., a general ward for fourteen beds, and three male surgical wards for sixteen beds, eighteen beds, and fourteen beds respectively. Covered ways lead from these wards to latrines on either side, and on one side also to an operation room. Almost at the middle of the covered way leading from the dispensary to the wards as above, other covered ways intersect—one leads to an accident ward, an European surgical ward, and an European medical ward; the others lead to a lying-in ward, a female general ward, and a female surgical ward. All these structures form almost a square, the dispensary being the front, the wards first described the rear, and the wards

last described the sides. Passing rearwards from the centre of the wards first described is a covered way leading to the offices, and another covered way from the offices passes to six wards, built in a line with the covered way, for female dysentery and female diarrhoea cases, and for male dysentery and male diarrhoea cases. Other detached buildings are a merchant seamen's surgical and a merchant seamen's medical ward for six and sixteen patients respectively, a male surgical ward for two beds, and a general medical ward for twenty-two, a planters' ward for paying patients, a lock ward, a mortuary, a laboratory, kitchens, baths and latrines, and resident medical officer's quarters. The whole of the buildings are calculated to afford accommodation for 234 patients.

Civil Hospital, Hyderabad, Sind.—The Civil Hospital, Hyderabad, is a building with only a ground storey, containing four wards, having spacious verandahs on either side, with a surgery and store-room at one extremity, and three small wards at the other. There is a detached female ward, and the necessary out-houses. According to a recent report, the number of persons treated at this hospital during the year 1890 was nearly 15,000, of whom 712 were indoor patients. There is a medical school attached, at which there is an average of thirty students.

Civil Hospital, Rangoon, Burmah.—This is an upper-storey building. The plan shows on the ground floor, a consulting-room, a dispensary, an operation room, and a surgery in the centre. At the extremity of the right wing there is a ward for sixteen Natives, with attached bath-rooms. At the end of the left wing there are a store-room and bath-room. All the intervening space on either side affords room for beds. On the upper storey, in the centre, there are a medical officers' room, and native doctors' and dressers' quarters; to the left there are a ward for twenty-eight Europeans, and another for sixteen Europeans, and to the right wards for thirty-four and twenty Natives; but this hospital has been much extended since the plan was drawn. There are now available 307 beds for males, and 44 for females. In 1890 the number of indoor patients was 6,192, and the number of outdoor 36,026: of the total, 3,738 were females.

The Cowasji Dinshaw Petit Dispensary, Umbergaon Thána Collectorate, Bombay Presidency.—This dispensary was erected with funds provided by the gentleman whose name it bears. It is a well-ventilated building, surrounded by a wide verandah. The central part consists of a dispensary and office. On one side

are a ward for two female patients and a consulting-room ; on the other side there are a ward for two male patients, and the store-room. Close at hand are the medical officer's quarters, servants' quarters, and cook-house, latrines, and dead-house. In 1890 there were 41 indoor patients, and 6,683 outdoor. This dispensary is kept in good repair, but an enclosure to its grounds is required.

Dacca Mitford Hospital, Bengal.—This consists of a central entrance-hall, to which are attached two receding wings, forming two wards, 63 ft. long by 48 ft. broad. At the extremities of these wings are connected latrines and bath-houses. There is a detached ward known as "Simpsons," for four females. There is also a detached cholera ward 39 ft. by 20 ft. with a connected latrine. Other buildings in connection are medical officer's quarters, cook-house, "godown" or store-room, latrines, and dead-house. The last available report shows 2,185 indoor and 16,873 outdoor patients during the year. This hospital is managed by the Dacca Municipality, and has an invested capital of Rs. 1,76,900.

De Souza Lying-in Hospital, Colombo.—This consists of a block in front composed of surgery, waiting-room, and hospital attendants' quarters, all surrounded by a verandah, from the rear of which a covered way leads to another verandah surrounding an attendant's central room, and two lateral wards, each 22 ft. by 33 ft. From the lateral verandahs a covered way passes on each side to three lying-in wards. From the rear verandah covered ways lead on each side to baths and latrines. At some distance in the rear is a block affording clothes' store, kitchen store, servants' room, and kitchen. On one flank is a mortuary.

European Hospital, Darjeeling.—This is an upper-storey building consisting of a central part and a wing on either side, the whole enclosed by a wide verandah. On the ground floor there is a central hall, from which a staircase leads to the upper floor. On either side of the central hall are four wards, 14 ft. 6 in. by 12 ft., having bath-rooms and dressing-rooms at the rear, with the wide verandah in front. To the right, commencing from the verandah and forming the right wing, is an operation room, a duty-room, a store-room, and a staircase ; then a dining-room, and a ward for ten paying patients, with bath-room, lavatory, and water-closets at the rear. Opposite the staircase, forming a projection from the wing, is a sitting-room. To the left, commencing from the verandah and forming the left wing, are a sitting-room, a dining-room, a staircase, and five wards, each for two paying patients, with water-closets,

bath-rooms, and lavatory at the rear. Opposite the staircase, and forming a projection from the wing, is a sitting-room. Between the wings, and entered from the rear verandah, there are a pantry on one side, and a milk and butter room on the other, whilst a covered passage leads to the cooking-room. On either side and continued as wings from the cooking-room are rooms for twelve native servants. The upper floor affords exactly the same accommodation, with the exception of the out-offices mentioned above, and with the addition of a balcony attached to the rear of the wings on either side.

General and Pilgrim Hospital, Cuttack, Bengal.—This hospital affords a dispensary and offices in the centre, and on either side three wards for eight, eighteen, and twelve patients. The end ward to the left for twelve patients is a female ward. There is a surrounding wide verandah, which in four places is enclosed to form store-rooms. The upper storey affords two wards with attached bath-rooms, for seven European males and seven European females. In 1890 there were 611 indoor and 4,618 outdoor patients attended to.

Gokuldas Tejpal Hospital, Bombay.—The Gokuldas Tejpal Hospital was erected at the cost of the gentleman whose name it bears. It is situated on the Esplanade, Bombay, close to the native town. It is a three-storey building. The wards, corridors, and verandahs are spacious, the floors are tiled, the ward walls are cemented for 4 ft., and then oil-painted. The ground floor affords a central hall, a dispensary, and four wards. The first floor gives an examination-room, an office, the surgeon's room, and wards on either side. On the second floor, there are an examination-room, an operation room, and wards. There are bath-rooms and latrines at the extremities on each storey, and this part of the hospital is faced with white tiling. A staircase for the attendants communicates from below upwards. The hospital makes up 120 beds, and the most recent available report gives 2,648 indoor patients and 14,905 outdoor patients during the year. In the hospital grounds are the resident medical officer's quarters, dead-house, servants' quarters, store-rooms, out-patient dispensary, &c. The requirements of the institution are: isolating wards, female nurses, a laundry, and an increase of the medical staff.

Háveri Dispensary, Dhárwar Collectorate, Bombay Presidency.—The Háveri Dispensary affords accommodation for four female and eight male patients, with bath-room, dispensary, and store-room. Medical officer's and servants' quarters are detached.

There are also a cook-house, a dead-house, and latrines. Between five and six thousand outdoor and some sixty indoor patients are usually treated at this institution during the year.

The Hutteesingh and Premabhái Hospital, Ahmedabad, Bombay Presidency.—This hospital was built many years ago by the families after whom it is named. It is situated within the limits of the large city of Ahmedabad. It is a one-storey building raised on a plinth, and consists of a central hall, part of which is used as a dispensary and part as an out-patient room, with laterally two large wards supported by pillars, and in which three, or even four, rows of beds are placed. In front and rear are spacious verandahs. In the hospital grounds are a small detached surgical ward, a small female ward, a detached ward for low-caste natives, with the necessary outhouses, but the accommodation for servants is insufficient. There is also a medical school house and dissecting-room in the enclosure, at which there is an average of sixty students. There are many requirements at this hospital. The pillars supporting the large wards of the central main hospital encroach on the space, but this could not be altered without a radical reconstruction of the hospital, when, of course, wards would not now be built to contain more than two rows of beds. A ward for Europeans is also needed. The detached female and low-caste wards are too small. Better accommodation for servants is desirable, and an operation theatre is a necessity. In an inspection report on this hospital, the Surgeon-General remarked that “a hospital sufficiently important to warrant the attachment of a medical school certainly should not be stigmatised by imperfections as above.” Pecuniary considerations, which it is hoped may soon be overcome, not want of will, are the cause. According to the most recent available report (1890) there were 1,797 indoor and 20,607 outdoor patients during the year.

Indi Dispensary, Bijápur Collectorate, Bombay Presidency.—This dispensary affords accommodation for eight male and four female patients. There are also a bath for both classes, store-room, and dispensary. In detached blocks are the medical officer's and servants' quarters, cook-house, dead-house, and latrines. Some 3,000 outdoor and 30 indoor patients are treated at this Dispensary during the year.

Jaunpur Dispensary, North-West Provinces.—This dispensary is almost in the form of a square. It consists of a central block in which are the dispensary, receiving-room, and other offices,

connected by a covered way, and extending at right angles are male wards to the right, and female wards to the left. The rear of the square, or rather oblong, is completed by the servants' quarters, but at the right-hand rear angle there is a ward for contagious diseases. Latrines are placed between this ward and the servants' houses, which certainly is not a good position. During the year 1890, 717 indoor patients were treated, and 18,542 outdoor patients. Of the total, 2,402 were females. It should be mentioned that there is also a separate female dispensary at Jaunpore.

The Kalutara Hospital, Ceylon.—This is a single-floor building surrounded by a wide verandah. In the centre is the surgery, and on either side are wards, 20 ft. by 42 ft., one used for females, the other for males. A covered way from the centre of the side verandah of the female ward leads to bath-rooms and latrines. A covered way from the end of the side verandah of the male ward leads to servant's room, store-rooms, and kitchen. From the centre of the rear verandah a covered way leads to the hospital assistants' and matron's quarters, in the rear of which another covered way passes to a female ward, 21 ft. by 20 ft., surrounded by a verandah. From this verandah there is another covered way to earth-closets and baths. As out-buildings, detached from the other structures, there are a female and a male separation ward 15 ft. by 11 ft. There are also a mortuary and two wells.

Laharunpur Dispensary, North-West Provinces.—This is a well-built structure, and affords accommodation for twelve patients, a dispensary, &c. There are also detached medical officers' quarters. It is supported by a Government grant, and by municipal contributions. During 1890 there were 727 indoor and 24,654 outdoor patients.

Leper Hospital, Madras.—The Leper Hospital, Madras, consists of three blocks, having each a verandah in front and in rear. Attached to it are a store-room, medical officer's quarters, cook-room, latrines, &c. This hospital has been considerably enlarged since the plan was made, and there is now space for 120 males and 40 females. The last available report gives 345 as the number of patients treated during the year, and of these 81 were women and 5 children.

Lock Hospital, Madras.—This was not built for the purposes of a hospital, but is a bungalow utilised as a hospital. There are a central hall and four wards on each storey. Before the suspension of the Contagious Diseases Act in India, in consequence of a motion of the House of Commons in 1888, this hospital was conducted

under the Act ; since then it has been continued as a voluntary lock hospital. One hundred beds can be made up here, and the most recent available report shows 350 females treated during the year.

Lying-in Hospital and Female Dispensary, Madras.—The hospital consists of separate upper storey blocks. The central block contains, below, a dispensary and washing-house, with, to right and left, native labour wards. Above, on the one side there is the office, on the other an European labour ward. A lift connects these storeys. Extending right and left from the ground floor of the central block covered passages lead to lateral blocks. These are divided into wards for four patients each, with a nurse's room, and scullery in the centre. Extending longitudinally are other covered passages which communicate with the rear blocks, affording exactly similar accommodation. The upper floors of all these blocks are divided in similar manner. All are supplied with baths, &c., and are surrounded by wide verandahs. Extending from the right-hand lateral ward is a covered way, leading to three cottages. Close at hand are the matron's and nurses' quarters, cook-house, medical officer's and servants' quarters, latrines, &c. Altogether there are seventy-four beds available in this hospital. In 1889 there were 2,195 indoor and 21,037 outdoor patients.

Madras Women's and Children's Hospital.—A handsome building in the form of a square. The central portion consists, passing from right to left, of a bedroom for nurses, a day-room for nurses, a surgery, an office with a waiting-room, and an examination-room, there being verandahs in front and in rear. The wings extending at right angles afford five wards each, all enclosed by verandahs. The anterior corner of the verandahs enclosing these wards are utilised as bath-rooms. By a recent report it appears that 3,195 patients were treated in this institution during the year.

Mayo Memorial Hospital, Nagpur, Central Provinces.—After the murder of Lord Mayo, Viceroy of India, at the Andamans in 1872, it was decided to raise a memorial at Nagpur. The hospital was designed to consist of one central main block and two wards *en échelon* on either side. These were completed as funds were available. The central block, or European hospital, consists of a ground floor, affording an outdoor patients' prescribing-room, a dispensary, and an operation room, each 25 ft. by 21 ft. On the upper storey there are three wards of the same size, with two lavatories. The lower floor is laid with hard sandstone, and the upper

with Portland cement. The outer walls are sandstone, and the inner red brick. The roof is corrugated iron. The wards are lofty, the ventilation perfect, and a broad verandah surrounds the whole. To the right of the central hospital, but standing back, is the native male surgical ward, a detached building constructed of brick, with asphalt floor and iron roof, dimensions 62 ft. by 20 ft., calculated to accommodate sixteen patients. To the right of this again, but standing forwards, is the Native female general ward, of similar size and similar construction, but divided by 8-ft. partitions into one ward for four patients and four compartments for one patient each. To the left of the main building, standing *en échelon* as on the right, are the male medical ward and the Native maternity ward. Both these are of the same construction and dimensions. The demands on this hospital were so great that it became necessary to supplement the accommodation. This was effected by utilising some adjacent buildings formerly occupied as a medical school. These buildings consist of a quadrangle affording forty-eight separate rooms, a special ward, brick and tiled, for eight patients, and a cholera and small-pox ward for four. Latrines, cook-houses, dust-bins, and all necessary outhouses are situated to the rear of the buildings above described. The hospital is maintained partly by Government, partly by the Municipality, and to some small degree by private donations. There was formerly a medical school attached to this hospital, but as it did not prove very successful it was abolished.

Medical College Hospital, Calcutta.—The commencement of this hospital dates from 1835, when a committee reporting on the health of Calcutta recommended the institution of a large central hospital. Subscription lists were opened, and from various sources some Rs. 2,36,772 were collected. With this the present Medical College Hospital was built, affording 97 superficial ft. and 2,500 cubic ft. for 300 patients. This old hospital consists of three storeys, the offices being in the centre, and wards on either side. This hospital has often proved more or less unhealthy, doubtless owing to overcrowding, a circumstance which led to the addition of another building, known as the "Eden Hospital." This new building, which was opened in 1882, cost Rs. 4,47,000, and was for eighty patients, affording 144 superficial ft. and 2,800 cubic feet per bed. An obstetric hospital was also provided. This affords on the ground floor a dispensary, a resident surgeon's room, &c., in the centre, and on the left a ward for twelve women, and two connected pavilions

at the corners. On the right there are rooms for the pupils, students and nurses on duty, the Goodeve scholar's room, and bath-rooms. At the corners there are a delivery ward, and an instrumental ward. The first floor consists, on the left, of a ward divided into ten compartments, and, on the right, of a ward. On the second floor, to the right, there is a ward for twelve Europeans. The isolated wards on this floor are used chiefly for offensive or infectious cases. The nursing at the Medical College Hospital, Calcutta, is provided by the Calcutta Nursing Institution, under the inspection of the Sisters of St. John the Baptist. During 1890 the indoor patients numbered 6,741, and the outdoor 52,108. Very recently, all the latrines of the main hospital have been remodelled, and a steam laundry has been instituted. The expenditure is met from various sources—government, municipality, paying patients, contributions, students' payments.

The medical college attached to the hospital dates from 1835, when a few students attended. There were recently 227 male and 14 female students. There is a full staff of professors, and their certificates of lectures are received by all examining boards. Recently the example of Bombay has been followed and the training of soldiers' wives as sick nurses and midwives has taken definite shape at the Calcutta Hospital. Accommodation for nine women has been found, who are under the supervision of the Ladies Committee of the Calcutta Nurses' Institution, and as regards their professional duties under the medical officers of the hospital.

Meerut Dispensary, North-West Provinces.—The Meerut Dispensary is a long one-storey building. In the centre are the dispensary and usual offices. On the right is a long ward 94½ ft. by 20 ft., which is used as a police hospital. At the end of this ward are bath-rooms, &c. On the left are two wards, one for Native males and one for females. There is a wide verandah in front and in rear. Besides the police, the dispensary will accommodate seventeen males and seventeen females. In 1890 the number treated were 922 indoor patients, and 11,817 outdoor, of whom 336 were women. There is also a female dispensary at Meerut, but not in connection with this institution.

Ophthalmic Hospital, Madras.—This consists of an administrative central block, with a ward for males to the right, and another for females to the left, connected by covered passages. There are latrines at some distance to the rear of these wards, also connected. The kitchen occupies a central position in the rear

of the administrative block, and between the passages to the latrines. In the front, but detached, is a dispensary for out-patients, and at a little distance, on the left front, are the medical officer's quarters. All the central blocks are upper storeyed. Below, the administrative block contains steward's room and office, steward's store-room, lamp-room, surgery, and medical store-room; above, there are a medical officer's room, an ophthalmoscopic room, and an operation theatre. The ground floor of the female block affords two wards, one for six and the other for fourteen patients, and above there is one ward for eight European females, and a superior ward for six. Similar accommodation is afforded for males in the opposite block. The last available report gives 1,376 indoor and 5,961 outdoor patients treated in this hospital during the year.

Pimpalgaon Baswant Dispensary, Nassik Collectorate, Bombay Presidency.—This dispensary consists of medical officer's quarters, a ward for males and another for females, a dispensary, and a consulting-room. Detached are a cook-room, a dead-house, and latrines. The average yearly number of patients treated at this dispensary is 10,000 outdoor and 40 indoor.

The Prince of Wales Hospital, Benares, North-West Provinces.—This consists of a central block containing the offices, and of three other blocks on either side, the two first being the largest, and all connected by covered passages. These, together with detached cook-houses, almost complete a circle. All the wards are 18 ft. wide, but vary in length. On either flank, but towards the rear, are ranges of servants' houses. During 1890 there were 1,456 indoor and 40,633 outdoor patients treated here.

Sanganer Dispensary, Ahmednuggur Collectorate, Bombay Presidency.—This dispensary consists of verandahs front and rear, a surgery, dispensary, and store-rooms, with wards for eight male and eight female patients. Attached to the dispensary are medical officer's quarters, dead-house, and latrines. About 12,000 outdoor and 40 indoor patients are usually treated at this dispensary during the year.

The Sassoon Hospital, Poona, Bombay Presidency.—This hospital was built by the liberality of the Sassoon family about twenty-five years ago. It is a handsome upper-storeyed structure, and the wards are lofty, well-ventilated, and surrounded by a spacious verandah. On the ground floor, to the right of the central hall, is the dispensary and surgeon's room (not shown on the plan). The upper storey is divided into four wards. The latrines and

bath-rooms are on each side, with a spiral staircase for the attendants. The grounds belonging to this hospital are of considerable extent, and contain resident medical officers' quarters, servants' quarters, detached wards, a midwifery institution, quarters for nursing sisters, and a medical school. In this school students are educated through a three years' course of lectures, &c. up to the hospital assistant standard. There are usually some fifty pupils, many of whom enter the subordinate branches of the military and civil medical departments, while others become private practitioners. The principal requirement at this hospital is a detached outdoor patients' dispensary. During 1890 there were treated 2,449 indoor and 10,909 outdoor patients.

The Sir Jamsetjee Jeejeebhoy Hospital, Bombay.—The Sir Jamsetjee Jeejeebhoy Hospital was built nearly fifty years ago with money given by the late Parsee baronet. It is situated immediately outside the most populous part of the native city of Bombay at Bycullah, and faces one of the main roads. It is an upper-storey building, so far as the centre is concerned, in the form of the letter H, surrounded by wide verandahs on all sides and on both storeys. The central part below consists of a spacious hall with the staircase, and on each side are the different offices, viz. writing-room, dispensary, reception-room, store-rooms, &c., with the operation theatre in the rear. This is extended backwards between the lateral wings, while in front the hospital porch and entrance are projected forwards. From the central part, devoted to purposes as above, wards extend to join the lateral wards, or the sides of the letter H. The whole is raised on a three-feet plinth. The upper storey covers the central part, and is partially divided into one central ward and four smaller ones. All the wards are spacious and floored with Minton tiles. There are Parsee, Mussulman, Hindoo, and surgical wards, with several small detached wards for special cases. The latrines are situated at the end of each ward and connected by a covered passage, and are attended to by hand labour, *meheters* (sweepers) being in constant attendance. The hospital is constructed to accommodate 350 males and 92 females. But this number has often been exceeded by utilisation of the spacious verandahs. Although every care is taken in the sanitation of this hospital, erysipelas, pyæmia, and traumatic tetanus not unfrequently occur, and wards have to be closed. Having been built so long, it is, in some respects, behind the age. The operation theatre opens into the central hall; the lateral connecting wards are somewhat

confined, and the upper central ward is still more so. The store-rooms are, also, too dark. The most recent available report (1890) shows that 7,095 indoor and 43,553 outdoor patients were treated during the year. In times of epidemic the accommodation is supplemented by tents. The ground belonging to the hospital is spacious, containing not only the resident officers and native servants' quarters, but also the following buildings in connection with the hospital :—

1. *Nursing Sisters' quarters*.—This is a recent upper-storey building to accommodate eight inmates. There are also women's student quarters capable of accommodating three inmates, who are usually soldiers' wives desirous of learning nursing.

2. *The Obstetric Hospital*, which need not be described, is a new hospital in course of construction for women and children. According to a recent report of this hospital, there were 427 indoor patients during the year, 222 being labour cases.

3. *Ophthalmic Hospital*.—This institution consists of four wards and the necessary out-offices. It is complete in itself, and is always thronged with patients. During 1890 there were 506 indoor and 8,833 outdoor patients.

4. *Incurable Ward*.—This is a handsome detached building containing two wards, and was formerly devoted to lepers.

5. *Cholera and Small-pox Wards*.—These are detached structures capable of accommodating twelve patients each. They are zinc-roofed, and the walls are chiefly of lattice-work. In times of epidemic these wards are supplemented by tents. New contagious disease wards are in course of construction.

6. *The Fumigation chamber*.—

7. *The Grant Medical College* is an upper-storey building containing library, museums, laboratory, lecture-rooms, &c. There is a full staff of professors and a large medical school of some hundreds of students. The course of study in this school is recognised by all the principal colleges of Great Britain. A new physiological laboratory is in course of construction.

The Takhtsingji Hospital, Bhaunagar.—We have only been able to obtain a plan of the upper floor of this hospital. It will be found, however, of interest because it represents a type of institution—that is, the class of hospital to be met with in the smaller Native States of India. Sir William Moore was recently called to task by the Indian Press on the ground that in a recent paper on the subject he did not do justice to that development of the

hospitals and kindred institutions in the Native States of India. A misapprehension appears to have arisen from the account he gave of the condition of these States thirty years ago. Anyone who reads this paper carefully will see that Sir William Moore proceeds to point out that recent developments have placed these States in a satisfactory condition so far as medical institutions are concerned. The plan of the Takhtsingji Hospital, Bhaunagar, will at any rate show that, so far as hospital construction is concerned, the type of Native State hospital which we give leaves little, if anything, to be desired.

The Thomason Hospital, Agra, North-West Provinces.—

This hospital is a long building, divided into five wards, with front and rear verandah. The latter is utilised by division into several compartments, which are applied to various purposes, the division being so effected as not to impede thorough perfilation of air. There is also a detached European hospital, affording two wards 14 ft. by 20 ft., with surrounding verandah and bath-rooms attached. The dispensary for outdoor patients is another separate structure, divided into consulting-room, office, dispensary, and stores. Recently this hospital has been extended by the provision of an upper storey to the main building and the addition of an operation theatre. There are now seventy beds for males and sixteen for females. In 1890 the patients numbered 19,301 men, 3,409 women, and 8,938 children—total 31,648. Of this total, 2,088 were indoor patients. The number of females treated at this hospital is somewhat small, a circumstance which is accounted for by the existence of a special dispensary for females at Agra. There is a medical school attached to this hospital, in which students are educated by a three years' course of study up to the standard of hospital assistants.

Triplicane Hospital, Madras.—This is an upper-storey building. On the ground floor to the right there are the dispensary and surgery, forming one wing, whilst three central wards passing front and rear, with female wards extending at right angles, form the other wing. The upper storey extends only over the three central wards, and is similarly divided. There are the necessary latrines, store-rooms, &c., provided in different parts of the hospital enclosure. Eight hundred and thirty-seven indoor and 24,012 outdoor patients were treated here in 1889. It is a municipal institution.

Indian Hospitals and Dispensaries.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
Calcutta, Medical College Hospital ..	380	ft.	ft.	ft.	ft.	ft.	ft.
Calcutta, Campbell Hospital, Sealdah ..	—	—	97'00	—	2,500'00	—	—
Bengal, Daeca Mitford Hospital ..	—	—	—	—	—	—	—
Bengal, General and Pilgrim Hospital, Cuttack ..	52	—	—	—	—	—	—
Madras, Lying-in Hospital and Female Dispensary ..	74	—	—	—	—	—	—
Madras, Ophthalmic Hospital ..	68	—	—	—	—	—	—
Madras, Triplicane Hospital ..	—	—	—	—	—	—	—
Madras, Lock Hospital ..	100	—	—	—	—	—	—
Madras, Leper Hospital ..	160	—	—	—	—	—	—
Madras, Women and Children's Hospital Bombay, Sir Jamsetjee Jeejeebhoy Hospital ..	442	—	—	—	—	—	—
Bombay, Cama Hospital for Women ..	120	—	—	—	—	—	—
Bombay, Gokuldas Tejpal Hospital ..	—	—	—	—	—	—	—
Ahmedabad, Huttreesingh and Premabhai Hospital ..	—	—	—	—	—	—	—
Poona, Sassoon Hospital ..	—	—	—	—	—	—	—
Sind, Civil Hospital, Hyderabad ..	—	—	—	—	—	—	—
Indi Dispensary, Bombay Presidency ..	12	—	—	—	—	—	—
Pimpalgaon Baswant Dispensary, Nassik Collectorate, Bombay ..	—	—	—	—	—	—	—
Cowasji Dinshaw Petit Dispensary, Um- bergaon Collectorate, Bombay ..	4	—	—	—	—	—	—
Borsad Dispensary, Kaira Collectorate, Bombay ..	12	—	—	—	—	—	—
Háveri Dispensary, Dhárwár Collectorate, Bombay ..	12	—	—	—	—	—	—
Sanganer Dispensary, Ahmednuggur Collectorate, Bombay ..	16	—	—	—	—	—	—
Nagpur, Mayo Memorial Hospital ..	—	—	—	—	—	—	—
Agra, Thomason Hospital ..	86	—	—	—	—	—	—
Meerut Dispensary ..	—	—	—	—	—	—	—
Cawnpur Dispensary ..	—	—	—	—	—	—	—
Laharunpur Dispensary ..	12	—	—	—	—	—	—
Benares, Prince of Wales Hospital ..	—	—	—	—	—	—	—
Jaunpur Dispensary ..	—	—	—	—	—	—	—
Lucknow, Bulrampur Hospital ..	—	—	—	—	—	—	—
Rangoon, Civil Hospital ..	351	—	—	—	—	—	—
Colombo, Civil Hospital ..	—	—	—	—	—	—	—
Colombo, De Soyza Lying-in Hospital ..	—	—	—	—	—	—	—
Kalutara Hospital, Ceylon ..	—	—	—	—	—	—	—
Darjeeling, European Hospital ..	—	—	—	—	—	—	—
Bhaunagar, Takhtsingji Hospital ..	—	—	—	—	—	—	—





CHAPTER XI.

SPECIAL HOSPITALS.

Are Special Hospitals requisite or desirable?—General Considerations:—

(1) *Children's Hospitals.* (2) *Hospitals for Consumption and Chest Diseases.* (3) *Jaffray Chronic Hospital.* (4) *Hospitals for Infectious Diseases:* (a) *Hospitals of the Metropolitan Asylums Board;* (b) *Provincial Infectious Hospitals;* (c) *Foreign Infectious Hospitals.* (5) *Hospitals for Incurables, Cancer, and Paralysis.* (6) *Lying-in Hospitals.* (7) *Convalescent Hospitals.* (8) *Mineral-Water and Sea-Bathing Hospitals.* (9) *Various Special Hospitals:* (a) *Throat and Ear Hospitals;* (b) *Lock Hospitals;* (c) *Eye Hospitals;* (d) *Diseases of Women;* (e) *Stone and Fistula;* (f) *Skin Diseases;* (g) *Homœopathic.*



THE class of hospital now to be considered is one which presents many difficulties. It is said, and with reason, of many of these institutions that they can show no claim to a separate existence. On the other hand it is urged, and also with justice, that without special hospitals the advance of science in the treatment of special diseases would have been arrested. Some special hospitals there are whose existence is a necessity in the interests of society; some which have come into being in the interest of individuals. There is much to be said on both sides, but it is unfortunately a subject which cannot be adequately discussed without trenching upon matters of a too personal kind.

As regards children's hospitals as separate institutions there is something to be said for and against. It is not good, it is said, for children to be treated in the same wards with adult patients—on ethical grounds, because they may see or hear things they ought not to see or hear; and on administrative grounds, because they can be better cared for if associated with other children only.

On the other hand there seems to be in most children's hospitals an inevitable tendency to the outbreak of infectious fevers, which does not exist where children are treated in the same wards with adults. One cause of this is probably to be traced to visiting days and the impossibility of exercising any efficient control over the visitors. Another circumstance not remotely connected with the evil is the too near proximity of the out-patient department. In a children's hospital, more than in any other, it is a necessity to have the out-patient department in a separate building.

With proper precautions, it is possible, if not entirely to abolish, at least to minimise, these risks, and with this proviso it will probably be admitted that special hospitals for children are, if not absolutely necessary, at least eminently useful and beneficent, institutions.

Hospitals for consumption and chest diseases are intended to meet the case of a class of patients who can but seldom gain admittance to a general hospital. Ordinary cases of phthisis are usually of so chronic a nature that, when once admitted, it is difficult to discharge them. The disease, too, is one of such wide prevalence that it would operate greatly to the prejudice of patients suffering from other diseases if phthisical patients were admitted without limit.

Another important reason for special hospitals for this class of diseases is that the ventilation by open windows, which is the rule in general hospitals, is impossible in wards occupied by phthisical patients. The temperature in the latter must be kept uniform, and the incoming air must be warmed before it is admitted, and, above all, draughts must carefully be avoided. The dietary also in general hospitals, owing to its lack of variety, is unsuitable to the capricious appetites of the phthisical. Finally, the period which patients are allowed to remain in a general hospital is usually too short to effect any permanent improvement in consumption, patients requiring ordinarily two to three months' residence to produce any good effects.

On the other hand it has been said that the aggregation of large numbers of phthisical patients in one building tends to aggravate the disease and to create a sort of concentrated atmosphere of disease. In support of this contention no facts have been brought forward, and the evidence of the observed facts at Brompton tend in exactly the opposite direction.

Fever and small-pox hospitals are necessarily separate institu-

tions, in the interest of the general public. They are primarily defensive, secondarily curative. There is no need to point out the necessity for isolating the infectious fevers. It has been recognised in one way or another ever since the Mosaic ordinance for the separation of lepers.

Cancer is a disease which, though chronic in all cases and incurable in many, can be, and is, successfully treated within the walls of a general hospital. It is only necessary to point to the cancer wards at the Middlesex to establish the fact without dispute. At the same time the regulations of most general hospitals preclude the admission of cases of this nature, and for this reason, and not for special characteristics of the disease or its treatment, cancer hospitals must be allowed a legitimate place in the ranks of special hospitals. For other chronic diseases and for incurables the same reasons apply.

Lying-in hospitals have been the subject of more controversy and severer criticism than probably any other class of special hospitals. The frightful mortality in the old Hôtel Dieu at Paris, recorded by Tenon as sometimes amounting to as much as nineteen deaths out of twenty accouchements, led that eminent authority to suggest the plan of special maternities. The plan of having lying-in wards attached to general hospitals has, however, never been abolished in Paris, notwithstanding the fact that the results still continue to be disastrous.

The first lying-in hospital to be established in the British Isles was the Rotunda Hospital in Dublin, which was opened in 1745; the result of the exertions, against much opposition, of Dr. Bartholomew Mosse, and this is still by far the most important and one of the best hospitals of its class in the Kingdom. In 1749 a lying-in hospital was established in Brownlow Street, Long Acre; in 1750 the City of London Lying-in Hospital, in 1752 the General Lying-in Hospital, Bayswater (now Queen Charlotte's Hospital), and in 1765 the Westminster Lying-in Hospital were established. These hospitals are all in existence to this day, and that their number has not been increased is probably due to the fact that such excellent and in some respects superior accommodation has been provided in the infirmaries attached to workhouses.

In the "Report of the Committee appointed to consider the Cubic Space of Metropolitan Workhouses" (Eyre & Spottiswoode, 1867) the remarkable fact is recorded, that the deaths from puerperal fever were six times as much in London lying-in hospitals, and ten

times as much in the hospitals of Vienna and other large continental cities, as in the workhouse infirmaries of London. And the Committee attributed the comparative immunity enjoyed by the workhouse infirmaries partly to the very much greater air space allotted to each patient in those institutions than that afforded by the lying-in hospitals. It is certain also that the very defective sanitary arrangements of the latter had, at the time of the report, much to do with their unhealthy conditions. The most important point, however, is the necessity for the rigid isolation of each parturient woman for a certain time during and after delivery. This period is fixed by the "*Rapport sur les nouvelles Maternités*" * at six days. It is also important that ready means should be at hand for at once isolating a suspicious case.

Apart from the accommodation afforded by workhouse infirmaries, some provision would appear to be necessary for parturient women who from one cause or another cannot be confined in their own homes. Single women, domestic servants, wives deserted by their husbands are typical instances, and the lying-in hospital is more likely, if it is, as is the case at Queen Charlotte's, connected with homes for fallen women, to act as a bridge to lead the patients back to a life of virtue than the wards of a workhouse infirmary.

Convalescent hospitals form a link between the hospital and the home. They take up and complete the work done in the hospital, and are a necessary and important complement of the latter.

Mineral-water and sea-bathing infirmaries are special institutions with special local advantages. They deal largely with skin diseases, and must be regarded as special hospitals, inasmuch as they only profess to treat those particular diseases which the special local agencies are calculated to alleviate.

Ophthalmic hospitals owe their origin, like many of the class remaining to be dealt with, not to the existence of any special conditions necessary to the treatment of eye diseases and unobtainable in a general hospital, but to the desire for more careful and specialised study of those diseases. It is not pretended that eye diseases cannot with proper arrangements be treated in a general hospital. The eye is more susceptible than any other part of the body to septic poison, but, on the other hand, it does not of itself produce the poison. The conditions, therefore, necessary for successful treatment are isolated small wards, devoted to eye patients

* Paris, 1882.

only, and out of reach of any malign influence from other patients. These conditions can be and are fulfilled in many general hospitals.

For special hospitals for diseases of the throat and ear, stone, fistula, the special diseases of women, and skin diseases, there is even less to be said than for eye hospitals. Every medical authority writing on hospitals condemns in unsparing language the existence of these special hospitals. Yet there is one thing that must in justice be said : to many of these institutions is due a wonderful advance in the science and art of the special diseases for which they exist. The most emphatic note of the present age of medicine, as of other things, is specialism ; and these hospitals exist for and by specialism. That they have had an influence for good on the great general hospitals can hardly be denied ; but it is to be hoped that the day for founding special hospitals of this class has gone by, and that in the future the great teaching hospitals will be pre-eminent in every branch, whether special or general.

Military hospitals are classed among special hospitals, inasmuch as they are for a special class and are governed in a different way to general hospitals ; though they are, in fact, general hospitals for one sex only.

Poor Law Infirmaries might also, perhaps, conveniently be classed as special, but we have described their arrangement and construction in a separate chapter.

(1). CHILDREN'S HOSPITALS.

Aberdeen Hospital for Sick Children.—The site of this hospital is L-shaped, and is bounded at the top and along the bottom by streets, while the land adjoining the up-stroke on the left-hand side is an open garden (Castle Brae). The main building, which is of an oblong form with slight projections, occupies the extreme right-hand corner of the site, while about the centre of the part which answers to the up-stroke of the L is a second building of simple rectangular form. The main building is four storeys in height and contains—on lower basement floor, laundry and wash-house ; on upper basement, out-patients' department, quarantine ward, board-room, linenry, and work-room ; on ground floor, entrance hall, offices, two wards (medical), ward kitchen, bath-rooms, &c. ; on first floor, two surgical wards, eye ward, and operation theatre ; the second and third floors contain sitting-rooms and bedrooms for the staff. The mortuary, post-mortem room, and museum are detached.

The second block is an old chapel converted into wards, with nurse's rooms, &c. for infectious cases.

Birmingham and Midland Free Hospital for Sick Children.—This hospital consists of three distinct parts: (1st) the old hospital for general cases; (2nd) a fever hospital; and (3rd) the out-patient department. The latter is an independent building quite away from the other buildings. The site upon which the old hospital stands is a four-sided figure with unequal sides, and is connected with the site on which the fever hospital stands by a narrow strip of land at one angle. The old building was formerly a private house, subsequently it was used as a lying-in hospital, and finally, with wings added at each side, it became a children's hospital. The fever hospital consists of five blocks united together by a covered way open at the sides, and two detached blocks. One of the five blocks is a two-storey building containing nurses' rooms, kitchen, &c. The other four are one-storey wards, two of which are for scarlatina, one for diphtheria and croup, and one for quarantine. The detached buildings are mortuary and laundry.

Cheyne Hospital for Sick and Incurable Children, Chelsea.—This is a new building in course of erection. The plan is L-shaped, and the building, including basement, is five storeys in height. The first and second floors will be devoted to wards, and on the third floor will also be an infectious ward approached by an iron outside staircase. Part of the roof will be fitted up as a laundry with a drying flat. There are two external iron staircases for use as escapes in case of fire.

Children's Hospital, Bradford.—The plan of this hospital is based upon that of the Hastings Hospital. The completed design comprises a central block with two wings of circular wards. The east wing is left for future erection. The central block is five storeys in height, and contains the administration offices, with a ward for two cots on each of two floors. At the back is a wing connected to the main building by a corridor, with open sides, and containing on the first floor an isolation ward for six beds. On the floor below is the out-patient department. The planning of the wards is much marred by the placing of the "service" room or ward scullery and the circular staircase against the outer wall, by which three windows are lost and the continuity of the circle is broken. There is absolutely no necessity for the ward scullery to be placed close to the ward; it is not so at Hastings, from which the plan is so obviously copied, and the arrangement there works perfectly well.

The verandah connecting the ward with the central block is an excellent feature, also adapted from Hastings, but the two lifts in the lobby are ill-placed, and should certainly not be required in addition to the lift in the well of the staircase.

Children's Hospital, Gloucester.—This is a small hospital with only twenty-seven beds, and no plans have been obtainable.

Children's Hospital, Nottingham.—This hospital belongs to the class of irregular plans, and consists partly of old and partly of new buildings. The main block is roughly in the form of an L, the ground floor of the horizontal stroke being the out-patient department and administration offices, and the up-stroke a large ward. The latter part is also occupied by a ward on the first floor, while the first floor of the rest of the building contains two small wards and rooms for staff. A small separate building of three storeys contains isolation wards, with kitchen, &c.

Children's Hospital, Sheffield.—This hospital consists of two dwelling-houses thrown into one, with a wing recently added containing wards.

Children's Hospital, Wirral.—The present building is the third one occupied by this institution, and was opened in June, 1883. The plan is L-shaped, with a wing projecting downwards from the angle. The upstroke contains two large wards, each of fourteen beds, with the water-closets, sink, &c. placed in a wing at the end and separated by a cross-ventilated lobby. The horizontal stroke contains the administration offices, and the projecting wing contains the out-patient department on the ground floor and an eight-bed ward above.

Clinical Hospital for Women and Children, Cheetham Hill Road, Manchester.—This building appears to have undergone many alterations since its erection, and is evidently not of a type which its originators are proud of. Anyhow, the plans have been refused for the reason that the building so little approaches a model of what a hospital should be.

East London Hospital for Children, Shadwell.—The history of this hospital is so inseparably linked with the story of the life-work of one of the most nobly devoted men of whom even the great profession of medicine has to boast, that a brief outline of the main facts of a career all too short must here be given. Born in 1842, Nathaniel Heckford was in 1866 a surgeon on the staff of the London Hospital. During his student career he had carried

off all the honours possible to him, having in the same year taken the gold medal both for surgery and medicine. The year 1866 is memorable as the occasion of the last serious outbreak of cholera in London, and Heckford served as a volunteer in the Wapping District Cholera Hospital. Careless of his own prospects, heeding only the good of those around him, the young doctor realised that in the teeming courts and alleys of the East End there was scope for the energy he felt, for the work which he could do. Accordingly, in 1867, after the cholera epidemic had died out, he set himself to work to establish a children's hospital—a crying necessity in that overcrowded poverty-stricken quarter lying around Ratcliff Highway, as it was then called. On the 28th January, 1868, the "East London Hospital for Children and Dispensary for Women" was opened in an old warehouse at Ratcliff Cross. Here Dr. Heckford, with his equally devoted wife, lived until about a year before his death, and devoted not only his whole time (for he had on starting the hospital voluntarily abandoned his practice), but also his private means, to the work he had undertaken. The story has been told by Mrs. Heckford in the pages of "*Eastward Ho!*"* and in briefer form by the same hand in "*Voluntaries*,"† and will well repay perusal. It is sufficient to say here that, in the face of difficulties and anxieties without number, this devoted pair guided the fortunes of the young hospital through fair weather and foul, until the purchase of a new site and the settlement of plans for permanent buildings gave promise of a successful termination to all cares for the future of the hospital. It was just at this crisis that Dr. Heckford's health gave way, and he died on the 14th December, 1871, "a few days after the site of this Building was purchased by the Committee of Management of the Hospital," as the fact stands recorded on the mosaic tablet in the entrance hall of the hospital.

The buildings are not planned in any form that can readily be classified. The site is an irregular four-sided figure, the two longer sides being nearly parallel; the front towards the street being considerably inclined from a right angle with the sides. The main front building is wholly devoted to out-patient department and administration offices. At one end of this block a corridor running parallel to the side of the site gives access to the ward block, which is placed at right angles thereto. The wards are

* "*A true East End romance*," *Eastward Ho!* Vols. i. ii. iii.

† *Voluntaries*, by the Earl of Lytton and others. David Stott, 1887.

three in number, and the water-closets, bath-room, and nurse's bedroom are placed at the extreme end of the wards. There is absolutely no disconnection whatever between the wards and the water-closets—a serious and incomprehensible defect, which is not removed by the presence of flues and gas jets since added with this object. A small block containing isolation wards is placed at one corner of the extreme end of the site, and adjoining it are the laundry and mortuary. The committee, having recently acquired land adjoining the hospital westwards, propose to erect a new out-patient department, additional wards, and a new laundry, but the scheme is still in abeyance.

Evelina Hospital, Southwark Bridge Road, London.—This hospital was founded in July 1869 by Baron Ferdinand de Rothschild in memory of his deceased wife the Baroness (Evelina) de Rothschild. It receives and treats the children of the sick poor, without distinction of creed. The site is not a spacious one, but has a very long frontage towards three streets, viz., Southwark Bridge Road and Lombard Street and Queen Street. In form it is four-sided, one of the longer sides being a curve for the greater part of its length. The two shorter sides are unequal, one being less than half the length of the other. The site is perhaps best described as an oblong with one corner cut off, leaving a curved line. Along this curved line which fronts the road the main buildings are placed, returning at each end and leaving an irregular-shaped area behind. The fact of the site abutting on streets on three of its sides is of course of great advantage in point of air and light. The wards for the most part have windows only on one side, the other side being the corridor of access. The out-patient department is on the ground floor. The fever ward is a wing separated from the main building, but apparently in direct communication with the main corridor.

Fleming Memorial Hospital, Newcastle-on-Tyne.—This hospital was established about 120 years ago in a dwelling-house, and was carried on there until 1888, when the present new building was erected. The new hospital is built in the form of a T, and is two storeys high with a third storey over part. The total number of beds is sixty-two. The central part of the building projects both at front and back before the wings. On the ground floor in the centre is a large entrance hall, at the end of which is the principal staircase. To the left of the main entrance, and between a waiting-room for patients and the porter's office, is the patients' entrance.

The left wing is occupied by the surgery and dispensary, and the bedroom, sitting-room and bath-room, and water-closet for medical officer. At the back of the main central block is, on one side, a committee room for gentlemen, on the other a similar room for ladies. On the right of the main entrance is the board-room. The right wing contains the matron's rooms, with the store-room, linen-room and work-room. In the projecting wing at the back of the principal staircase is a large dining-hall, with a passage on either side, separated from the hall by a row of columns. Beyond this are the kitchen offices, and a separate staircase leading up to the isolation wards. On two sides of the kitchen yard the building containing the laundry, washhouse, and boiler-house is placed, and a detached building to the left contains the mortuary and post-mortem room. On the first floor the central block contains a large day-room, two three-bed wards for boys and two for girls, two nurses' sitting-rooms, and two ward sculleries. The two wings to right and left each contain a general ward for twenty cots, with a bath-room, two water-closets, and a sink. The wards are somewhat narrow, being only 20 ft. wide, and the position of the water-closet block interferes with the free cross-ventilation; the beds are coupled, and there is in no case a window between the end bed and the end of the ward. The fireplaces are placed in the side walls, an arrangement probably rendered necessary by the narrowness of the wards. The closets are separated from the ward by a cross-ventilated lobby, but by a strange oversight the slop sink is placed in the lobby, and the space allotted to it is far too confined. It is, of course, as essential to separate the slop sink from the ward as the closets, and the want of proper space in which to clean bed-pans, &c. is a serious defect. At the back of the principal stairs is a surgical ward for one bed, the operation-room and a dark room entered only from the latter. For the surgical ward, and for the six wards in the central block, there is no provision of water-closets except those attached to the large wards. The floor over the kitchen offices is occupied by two isolation wards for four beds each, with a nurse's bedroom, a ward scullery, a lavatory and bath-room, and one water-closet. The latter is very imperfectly cut off from the air of the wards.

Hospital for Hip Diseases in Childhood, Queen Square, London.—Strictly speaking this excellent institution is not a hospital at all. It is a home for children suffering from hip disease, pending their admission to the wards of a hospital. A certain

amount of treatment is carried on, but no operations. The buildings consist of three houses in Queen Square adapted to their present purpose.

Hospital for Sick Children, Great Ormond Street, London.

This hospital, the pioneer of English children's hospitals, was founded in 1852 by Dr. Charles West. Appropriately enough, the young institution found a home in two houses, Nos. 48 and 49 Great Ormond Street, one of which was the dwelling of Dr. Meade, the court physician of the early part of the last century. The old house, with its painted ceilings, its panelled walls, and marble floors, exists no longer, having but recently been demolished to make room for the completion of the hospital. The hospital began with the modest number of ten beds; this number was soon increased to thirty, and later on to fifty-two, and then to seventy-five. In 1875 the new building was opened. The building consists of a block of the single pavilion type (Class IA), with an isolated block at the north end. The pavilion block contains in the basement the out-patient department, a large portion of which is of one storey only, and is built out in front and back. Here also are the kitchen offices. The three upper floors contain the wards, with a chapel on the ground floor at the back. The latter is beautifully decorated and fitted up, and was a special gift from an anonymous donor. The isolated building at the north end contains servants' quarters, mortuary, chapel, post-mortem room, and museum in the basement, and isolation wards above. The new building on the site of 48 and 49 Great Ormond Street provides additional accommodation for out-patients, administration offices, and wards for about fifty additional beds.

Hospital for Sick Children, Pendlebury.—The plan of this hospital is a development of the multiple pavilion type of a somewhat unusual kind. From the front administration block, which faces west, a corridor projects to the east, from each side of which project three pairs of ward pavilions connected to the main corridor by branch corridors. The wards are all one storey in height, and are ventilated partly by artificial means. The apparatus consists of a fan which drives the air into the wards through shafts in the centre. In the winter the in-coming air is warmed by being made to pass over steam-pipes. The working of this system does not appear to be entirely satisfactory, and in 1880 it formed the subject of a very exhaustive examination by Dr. Angus Smith, F.R.S., the main facts and conclusion of whose report are set forth in

Dr. Thorne Thorne's Report to the Local Government Board.* The ward at the south-east is devoted to cases of scarlatina and measles, and in the report just referred to will be found a particularly interesting inquiry into the effects of the treatment of these cases within the walls of a general hospital. In the four years 1877-80, eighteen, fourteen, twelve, and twelve patients in the general wards contracted scarlatina under circumstances which left no doubt that the disease was actually contracted whilst the patients were under treatment in the hospital. Such a record of contagion clearly proves that the presence of scarlatina patients in a children's hospital is fraught with great danger to the other patients. It might, however, have been possible with different structural arrangements to have avoided the spread of contagion. The wards are all atmospherically connected by the long corridor with its connecting branches. If the branch corridor to the fever ward had been entirely omitted, and the ward itself placed further away from the one immediately opposite, probably the necessary conditions of isolation would have been fulfilled, and the patients in the general wards would not have been subjected to the danger of infection.

Hospital for Sick Children, St. Michael's Hill, Bristol.—

This is a building of the multiple pavilion type, consisting of a front administration block with the staircase at the back and a corridor running off at right angles thereto. On one side of the corridor are three ward pavilions two storeys in height. On the other side are two wings, one containing, on the ground floor, the nurse's dining-room and croup ward, and on the floor above the operation room and consulting-room, whilst the other wing, which is partly one storey only, contains the kitchen offices on the ground floor and servant's bedroom above. There are altogether five wards in the three pavilions, the ground floor of the furthestmost pavilion being a large play-room. The front block contains on the ground floor the board-room and matron's rooms, and on the first floor two wards for women and a ward in which babies requiring surgical operations are received with their mothers. Above are the nurses' quarters. In a separate building apart from the rest of the hospital are three small wards for isolation cases.

Hospital for Sick Children, Sunderland.—This is simply

* Supplement to the Tenth Annual Report of the Local Government Board; containing Report and Papers: *On the Use and Influence of Hospitals for Infectious Diseases.* 1882. Re-issued 1884.

an old house converted to its present purpose, giving accommodation for twenty beds only, and presents no features worthy of note.

Hospital for Women and Children, Cork.—This is a building of the L-shape, and was formerly a militia barrack, which was altered to meet the requirements of a hospital. The ground floor is occupied by administration offices, out-patient department, and operation room. The first and second floors are entirely devoted to wards. There are two single rooms on the second floor for private patients, and a large room for "semi-private" patients, presumably patients paying a less sum than those occupying private rooms. The wards are, with two exceptions, provided with through-ventilation, and the water-closets are effectually cut off from the wards. The building certainly presents a most favourable example of an old building altered for hospital purposes.

Infirmery for Children, Liverpool.—This hospital consists of a building in the form of a T, the upstroke being the new wing erected some five or six years ago. The only feature of note appears to be the covered airing-ground, which is formed in the ground floor of the new wing.

Jenny Lind Infirmery for Sick Children, Norwich.—This hospital was established in 1853 in an old mansion converted for the purpose. In 1880 an out-patient department was added.

Jubilee Children's Hospital, Gateshead.—The plan upon which this hospital is built is a somewhat unusual one. It consists of five blocks, a central administration block, and four ward blocks. From each side of the central block a corridor projects, and at a distance of about 50 ft. it meets another corridor running at right angles to it. The second corridor runs about 30 ft. on each side of the first one, when it joins at each end a ward block, which are, therefore, about 60 ft. distant from each other. The central block consists of two portions divided by the corridor. The front part is three storeys in height, and contains the residential quarters for the staff and a special ward; the back part contains the kitchen offices, operation room, and laundry. The latter communicates with the same corridor as the operation room,—a very objectionable arrangement, which could easily have been avoided by providing a covered way for access between the corridor and the laundry. The ward blocks are two storeys in height, and contain on each floor a ward for eighteen beds, day-room, ward kitchen, bath-room, lavatory, and water-closet. The hospital appears to be exceptionally well endowed in the matter of site.

North-Eastern Hospital for Children, Hackney.—This hospital consists of one long straight block in which the wards are placed, with the administrative building at one end. The out-patient department occupies the ground floor of the ward block, and comprises a large waiting-room, two consulting-rooms with a dressing-room between, and a dispensary. The water-closets are in direct communication with the waiting-hall. The wards are 84 ft. in length, and contain twenty-five cots arranged in pairs. There is, at the further end of each ward, a sister's room and a special ward. The water-closets are placed in a projecting wing, but have to be reached by passing through the bath-room. There appear to be no means of isolating infectious cases arising either in the wards or in the out-patient department.

Paddington Green Children's Hospital, London.—This small hospital consists of two ordinary houses altered and adapted to their present uses. The ground floor is occupied by the out-patient department, the yard at the back being built over to form a waiting-hall. On the first floor are two wards, one with eleven cots, the other with two, and the matron's sitting-room. On the second floor are two wards of similar size and a sitting-room for nurses. The top floor contains the kitchen offices and bedrooms for staff.

Royal Alexandra Hospital, Brighton.—This hospital was rebuilt in 1881, and consists of a nearly square front block with a three-storey ward block projecting from one angle. The front block contains all the administration offices, the nurses' quarters, operation room and small ward adjoining, and on the second floor a convalescent ward of fourteen beds. The ward block contains three wards, each for twenty beds. The first-floor ward has on the south-west side three projecting bay windows, and each ward has at the end a balcony. The water-closets and bath-rooms are placed, as at Norwich and Lincoln, in octagonal turrets at the angles of the wards. A special feature of note in this hospital is the use of marble for lining the surface of the ward walls on the ground and first floors. The upper part is white marble, while the dados in one case are red and in the other green. The cost would appear to have been about twice as much as plaster.

Royal Hospital for Women and Children, Waterloo Road, London.—This hospital was erected in 1810, and has received considerable additions in 1876 and in 1883. In plan it consists of one square block four storeys in height, including basement. On the ward floors the staircase is at the back, with sisters' room and

ward kitchen on either side ; and at each end a ward runs through from front to back, with a third in the front joining the two end ones.

Victoria Hospital for Children, Chelsea.—This hospital was established in 1866 in an existing house (Gough House) adapted to its new purpose by various internal structural alterations. In 1885 a new building was opened containing the out-patient department and the nurses' home. The old building still does duty as the hospital proper. There is also a small detached building containing the post-mortem room and two isolation wards.

British Hospitals for Children.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Hospital for Sick Children, Bloomsbury	139	8'00	76'66	12'00	919'92	17'06	249'71
East London	92	8'00	60'20	13'50	907'20	26'66	285'32
Victoria, Chelsea	54	6'50	59'50	14'00	833'00	10'66	806'66
Waterloo Road	52	6'50	66'08	14'00	925'12	22'22	104'61
Hip Diseases, Queen Square	—	—	—	—	—	—	—
North-Eastern, Hackney	—	* { 5'00 } { 8'50 }	70'56	12'75	899'64	17'74	—
Evelina	60	{ 8'50 } { 10'00 }	78'30	14'00	1,096'20	34'00	—
Paddington Green	26	—	—	—	—	—	—
Derbyshire	31	* { 4'50 } { 6'75 }	60'50	12'50	756'25	13'63	1,149'09
Sunderland	20	—	—	—	—	—	—
Bristol	64	av. 5'50	60'00	15'25	915'00	—	—
Gloucester	27	—	—	{ 10'50 } { 11'50 }	—	—	—
Liverpool	80	7'50	89'28	14'00	1,249'92	25'71	301'50
Clinical, Manchester	53	—	—	13'00	—	—	—
Pendlebury	168	10'00	99'00	17'00	1,683'00	60'00	1,296'42
Southern, Manchester	27	—	—	12'00	—	—	—
Jenny Lind, Norwich	27	5'00	55'25	13'00	718'25	11'11	978'44
Newcastle (Fleming)	62	* { 6'00 } { 5'00 }	62'50	13'00	812'50	18'00	2,107'74
Nottingham	30	av. 5'00	—	—	—	—	—
Brighton	80	—	—	—	—	—	816'75
Birmingham	72	—	—	—	—	—	—
Leeds	45	—	—	—	—	—	—
Sheffield	34	6'00	53'90	15'00	808'50	16'90	960'88
Garside, Manchester	—	—	—	—	—	—	—
Wirral, Birkenhead	40	9'00	79'20	13'00	1,030'64	23'57	1,361'2
Aberdeen	34	5'50	62'22	11'50	715'53	9'75	667'9
Gateshead	120	—	—	—	—	—	—
Bradford	—	—	—	—	—	—	—

* Coupled beds.

Foreign Children's Hospitals.

Children's Hospital, Basel.—This is a single straight block with the two ends slightly projecting at the back. The wards are lighted at the ends and communicate one with another. The operation room is on the upper floor, and is in direct communication with all the wards on that floor. There are two detached

buildings, one of which contains isolation wards, the other the washhouse and mortuary.

Foreign Children's Hospitals.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
			ft.	ft.	ft.	ft.	ft.
RUSSIA. St. Olga, Moscow	78	10'10	94'48	—	—	—	—
SWITZERLAND. Basel	54	—	108'20	—	—	—	—

(2). HOSPITALS FOR CONSUMPTION AND CHEST DISEASES.

City of London Hospital for Diseases of the Chest, Victoria Park.—In general form this building belongs to class 2C, or the rectangular U form. The basement contains all the kitchen offices and stores in the centre and north wing, and the out-patients' waiting-hall, dispensary, drug-store, and laboratory in the south wing. On the ground floor the central portion contains entrance-hall, secretary's office and board-room, library, and medical officer's rooms. The south wing is devoted to the out-patient department. The north wing contains rooms for medical officers, matron's rooms, servants' rooms and linen-room. On the first and second floors are wards of sizes varying from four to sixteen beds. The two wards at the extreme ends of the wings have cross-ventilation; all the other wards are arranged off the corridor. In each wing is a large day-room. The system of warming and ventilation is thus described : * "Under the basement floor there are two flues which run the whole length of the building : one of these communicates with the external air by a large passage extending 50 ft. from the building, and opening by louvres placed 6 ft. above the surface of the ground ; the other flue opens from the former into a chamber containing a coil of pipes, and has a constant circulation of warm water through it by means of pipes, communicating with the coil and heated by a boiler in the vault, in the rear of the building. All the corridors, wards, and waiting-rooms receive a direct supply of warm air ; but the warm air is not admitted into any of the

* Description of the internal arrangements of the building, published by the committee.

rooms occupied by the officers and attendants of the establishment. The flue in the tower by which the effete air is carried off, contains a coil of hot-water pipes and a cistern, which communicates with a second boiler, also situated in the vault in the basement. By the heat thus generated an ascending current of air is produced. With the tower flue, the corridors, wards, waiting-rooms, living-rooms, closets, &c., throughout the building have direct communications, so that the air in them is in constant process of removal. The hot-water cistern in the tower also yields the supply for the baths, lavatories, and other purposes." In extent of site and position, this hospital is exceptionally well favoured, occupying as it does a site of about four acres, immediately adjoining the main entrance to Victoria Park.

Consumption Hospital, Brompton.—This large and important hospital consists of two distinct buildings separated from each other by the Fulham Road. The old building on the north side of the road was erected in 1846, and contained 210 beds. The new building on the south side was erected in 1882, and gives accommodation for 138 in-patients. The old building is planned in the form of an H, with a projection on the ground floor of irregular shape from the cross stroke containing the kitchens, with the chapel placed crosswise at the back. The wards are all small rooms, the largest being 36 ft. by 18 ft. 6 in. connected together by corridors. The corridors are wide and are kept at the same temperature as the wards, and parts of them are used as dining-rooms for the patients. The ventilation in winter-time is effected by artificial means; in one half of the building the fresh air is passed over hot plates in the basement and thence passes to the wards, and the vitiated air is extracted by gratings near the ceiling leading to the smoke flues; in the other half the in-coming air is warmed by hot-water pipes in the basement, and the foul air is extracted by a tall shaft with a hot-water tank at the top. In addition to this apparatus, there are open fireplaces in the wards. The new building (see plan) is connected, by a subway under the road, with the old. Like the older building, the wards are all planned on the corridor system, and the corridors are purposely made wide in order to serve as day-rooms for the patients. The basement contains store-rooms, larders, and other administrative offices, a Turkish bath, and a compressed air chamber. On the ground floor, the eastern portion is occupied by the out-patient department, which consists of two waiting-rooms for male, and two for female patients, two physicians' rooms, each

with two dressing-rooms attached, and the dispensary. The central part is occupied by a large entrance hall with staircase. Adjoining this to the west are rooms for resident officers; and the back part of the west wing is occupied by a large recreation hall and lecture-room, fitted with a stage and retiring rooms. The first, second, and third floors are entirely devoted to wards, and are all arranged in a similar manner to the plan. The fourth floor contains in the central part a large kitchen and scullery, with larder, stores, &c., and living-room and bedrooms for servants. At one corner of the site is a small detached building containing the mortuary and pathological department. The warming is effected by means of open grates and hot-water coils, fresh air being admitted at the back of the latter and the ingress being regulated by valves. Extraction shafts are provided to all wards and rooms, and are connected to the four octagonal turrets, at the top of which are steam coils.

Consumption Hospital, Liverpool.—This is an adapted building, and the committee desire to preserve its home-like character, rather than to make it appear like a hospital. It consists of two large houses—one used for male, the other for female patients—which are connected together by a common dining-hall. The total accommodation for in-patients is fifty beds. The need for a special hospital for consumption and kindred diseases would appear to be exceptionally great in Liverpool. One out of every three deaths in that city, is, upon official authority, referable to this class of disease.

North London Consumption Hospital, Mount Vernon, Hampstead.—The present building consists of only a third part of the complete hospital as it is intended to be in the future. The complete scheme comprises a rectangular building of about 163 ft. long by 55 ft. deep. It is to afford accommodation for 110 patients. The main entrance is placed in the centre, and the principal staircase and the service staircase are just within the entrance. A wide corridor runs from end to end of the building with the rooms arranged on either side. The out-patients' department, which at present occupies a house in Tottenham Court Road, will, when the building at Hampstead is complete, be placed in the basement. The ground floor contains the administrative offices, with the resident officer's rooms and two day-rooms. The first and second floors are devoted to wards, which are rooms of varying sizes holding from two to eight beds each. On each floor is a large day-room, also bath-rooms and sisters' rooms. On the sunny side of the building are four open arcades, accessible to both wards and

day-rooms. The kitchen offices, nurses' and servants' bedrooms are placed in the top storey. There does not appear to be any provision of a scheme for artificial ventilation. The warming of the wards is effected by open fireplaces, and the corridors by a hot-water system. The accommodation in the part already erected amounts to thirty-seven beds.

Royal Hospital for Chest Diseases, City Road, London.—This hospital occupies a very confined site, which is almost entirely covered with buildings. The buildings are two in number—one, facing City Road, being five storeys in height, and containing the wards and administration offices, the other, which is one storey only in height, being devoted to the out-patient department. The front block is of irregular form. The wards are really four long rooms communicating with each other by wide openings, and having windows at the narrow ends only. These wards open into a wide corridor, in which are placed the water-closets, combined scullery and bath-room, and staircase. The rest of this block is occupied by the ordinary administration offices and residential rooms for the staff. The out-patient department is simple in arrangement, and presents no special feature for remark.

Royal National Hospital for Consumption, Ventnor, Isle of Wight.—The special feature of this hospital is, that it consists of a series of sixteen pairs of semi-detached cottages. Each cottage contains a dining-room and drawing-room.

British Hospitals for Consumption and Chest Diseases.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Brompton	348	—	115'00	13'00	1,495'00	—	—
City of London	164	7'00	65'62	13'00	853'06	13'12	996'03
Royal, City Road	—	6'00	81'72	14'00	1,144'08	17'22	—
Hampstead	—	6'00	64'00	14'00	896'00	20'70	*1,278'90
Liverpool	50	—	—	—	—	—	—
Ventnor	—	—	—	—	—	—	—

* For the total number of patients when complete.

(3). CHRONIC HOSPITAL.

The Jaffray Suburban Hospital, Birmingham.—This hospital is intended for the reception of chronic cases and is a branch of the Birmingham General Hospital. Hospitals devoted to the care of chronic cases are not common; indeed we cannot call to mind

any other example professedly intended for this class of cases only. By chronic cases are understood cases of such diseases as incipient paralysis, heart or lung disease of old standing, and other long continuing but not necessarily incurable complaints. Against such cases the doors of most general hospitals are closed, and the only alternative is the workhouse infirmary. The arrangements of such a building will of necessity vary greatly from those proper to an ordinary general hospital. For example, the majority of the patients will be able to leave their beds during the day; hence a suitable provision of day-room accommodation is needed, and, to economise service, possibly also a dining-hall. Many of the patients also will be in a more or less crippled state, either in limbs or in heart or lungs; to many such, the ascent of staircases would be not only a difficulty, but a positive danger. Lifts therefore, and easy access from one part of the building to another, and from the building to the grounds, would be for these patients a necessity. In planning the Jaffray Hospital, these facts do not seem to have received due thought. The building follows in its main lines the dual pavilion plan; the two wings being wards, and the central portion the administration offices, with a projecting part behind containing the kitchen, &c., and with bedrooms over for staff. In each wing are wards on two floors, each ward containing twelve beds, with a ward kitchen and small separation ward at one end. In these wards is comprised the whole of the accommodation for patients. There are no day-rooms, nor is there any dining-room for those patients who are able to leave their beds. As regards the approaches, there is, it is true, a lift from the ground floor to the upper floor, but in order to get into the grounds some three or four steps have to be descended. If the lift is freely at the disposal of all patients who require to use it, there is nothing more to be said on this point; but it too often happens that the use of the lift is so restricted as practically to debar the majority of the patients from availing themselves of it. With regard to the approaches, it would certainly seem as if a little thought might have obviated the need for steps, and that the doors might have been led up to by easy inclined planes.

(4). HOSPITALS FOR INFECTIOUS DISEASES.

The origin of hospitals for the special purpose of isolating persons suffering from contagious disorders, may be traced back to very early times: the Mosaic laws for the separation of

lepers being the earliest recorded examples of the recognition of the value of isolation. In the middle ages, one of the direct consequences of the Crusades was the importation of leprosy into Europe; and in France alone, in the time of Louis VIII., about 4,000 leper-houses were in existence; the total number of such institutions is put by a French writer at not less than 19,000 (Laboust, "*Origine des Maladreries*"). These leper-houses were commonly called lazarettos, or lazar houses, after the Order of St. Lazare, a religious body devoted to the care and treatment of lepers, the Grand Master of which was himself required to be a leper. In the year 1694 the disease had so entirely died out in France that an edict was issued by Louis XIV. making over all the then existing lazar houses to a newly-created body charged with the administration of hospitals. Oriental plague was another disease imported from the East, and pest-houses were provided to separate the sick from the healthy. It was not until the latter end of the last century that the necessity for isolating cases of infectious fevers was recognised in this country; and the earliest known instance occurs at Cheltenham, where in 1783 Dr. Haygarth established fever wards for the express purpose of isolation as distinct from treatment. About the same time a similar effort was made in Manchester, but it was not until the year 1800 that any effort was made to mitigate the fearful ravages made by fever (mainly typhus) in the overcrowded and unhealthy slums of London. To Dr. Willan belongs the distinction of having been the first, in March 1800, to point out the enormous rate of mortality from fever among the poor in the metropolis, and to urge the necessity, not only for improved sanitary conditions of life, but for separating the infectious sick from the healthy. On May Day 1801, The Society for Bettering the Condition of the Poor held a public meeting, at which it was resolved to establish a "house of recovery," and to organise a system of cleansing and disinfecting houses where fever had broken out. The direct outcome of this meeting was the opening, in 1802, of No. 2 Constitution Row, Gray's Inn Road, as a "house of recovery" for patients suffering from the then recognised forms of infectious diseases, other than small-pox. Very early in its history the authorities of the hospital began to urge upon parochial boards the desirability of their contributing to its maintenance in return for the treatment of their patients. But for some reason or other funds were not forthcoming, and the undertaking threatened to fail for lack of means. Its

cause was taken up by the great philanthropist William Wilberforce, and mainly through his advocacy a sum of £3,000 was voted by Parliament to the Society for Bettering the Condition of the Poor in trust for the hospital. In 1811, the hospital was moved to larger premises at King's Cross, adjoining the old Small-pox Hospital, where it remained until, in 1849, it was displaced by the Great Northern Railway Company, who required the land for their new terminus. In that year the existing hospital at Liverpool Road was opened for the reception of patients. Such is in brief the history of the London Fever Hospital; and it serves for a type of the development of fever hospitals in general. First the "house of recovery," for the treatment of the sick; and, following on the good effects of this, the "hospital" for the isolation of the infected, for the protection of the healthy. Under the provisions of the Public Health Act of 1875, which practically govern sanitary administration outside the metropolis, the various urban and rural sanitary authorities are the bodies charged with the duty of providing suitable hospital accommodation for infectious diseases within their respective districts. The fulfilment of this duty is a task very little to the taste of sanitary authorities as a rule; and as a consequence the provision of hospital accommodation gets shelved from time to time, until an epidemic occurs, when a frantic effort is made to put up a temporary hospital in a few days to cope with the emergency of the moment. Wooden or iron huts, or perhaps tents, are put up, the epidemic runs its course and dies out, and the town or district returns to its normal health conditions. The question of a permanent hospital is then quietly shelved, only to reappear with a recurring outbreak of fever. The great value of a permanent isolation hospital is that it provides the means of isolating at once the earliest cases of disease, and of thus preventing the epidemic, instead of leaving it to be battled with when it has got full sway. This fact is very strongly brought out in Dr. Thorne's "Report on the use and influence of Hospitals for Infectious Diseases," which forms the supplement to the Tenth Annual Report of the Local Government Board (1882). "I could occupy you for hours," says Dr. Thorne of the evidence he has collected, "in telling you instances in which epidemics have evidently been prevented by the isolation of first cases of infectious disease." On the other hand, of the hastily extemporised hospital put up to meet the demands of a sudden outbreak, Dr. Thorne says: "It is often not ready for occupation until the immediate cause of its erection has passed by; it provides

accommodation of a very indifferent sort ; it fails, almost without exception, to meet the permanent requirements of the district, even when in amount it turns out to be more than the district needs ; and thus the object of the hospital as a part of the sanitary defences of the district is often attained in a very imperfect manner, and at a needlessly large cost."

The necessity for isolation hospitals is therefore abundantly clear ; and if clear in the case of provincial towns and country places, how much more so must it be in the case of the metropolis ? The provisions of the Public Health Act, 1875, have never applied to London, but under the Sanitary Act, 1866, the various vestries and district boards have had, and under the Public Health (London) Act, 1891, continue to have, powers to provide hospital accommodation for such persons as, not being paupers, could not be isolated in their own homes without danger to their neighbours. Lodgers, for instance, or tenants of large blocks of model dwellings, with staircases or corridors in common, would come within this category. But these powers have never been made use of by the parishes and district Boards of the metropolis, except that two parishes (St. Pancras and Islington) erected temporary camp hospitals during the small-pox epidemic of 1881, and one parish (Poplar) erected a permanent hospital for small-pox, which, however, it subsequently made over to the Metropolitan Asylums Board. Until the year 1867, when the Metropolitan Asylums Board was created,* the only hospital provision for infectious diseases within the metropolitan area was, for fever, the London Fever Hospital, and for small-pox, the Highgate Small-pox Hospital. The Metropolitan Asylums Board is a body composed partly of members nominated by the Local Government Board and partly of representatives elected by the various boards of guardians. Its duties were for some years strictly concerned with the poor law, and it had no relation to the general health of the metropolis. Strictly speaking, no patient could be received at one of the Board's hospitals without a relieving officer's order ; and although this rule has gradually been relaxed, yet the constitution of the Board as a pauper authority remains unchanged. The case of London is therefore unique in this respect. In another way, also, the case of London stands alone, and that is in the present position of the question of the hospital accommodation for small-pox. In 1871-72, attention was drawn to the behaviour of small-pox in the immediate neighbour-

* Metropolitan Poor Act, 1867, 30 Vict. cap. 6.

hood of the Hampstead Hospital. Following upon this came reports of similar observations with regard to the hospitals at Fulham, Homerton, and Stockwell. In 1882 appeared Mr. Power's report on the influence of the Fulham Small-pox Hospital on the surrounding neighbourhood, and in the same year the Royal Commission on Hospitals for Infectious Diseases was appointed. The result of all this inquiry and discussion was an almost general agreement among those most able to judge, that something like a *primâ facie* case had been made out in favour of the view that a small-pox hospital of more than a certain number of beds may be a source of danger to the surrounding inhabitants; and that the danger decreased in a definite ratio as the distance from the hospital increased. The outcome of the Royal Commission was a recommendation that the number of beds appropriated to small-pox in any one of the Board's hospitals should be limited to forty, and the practical result has been that small-pox has been almost entirely relegated to the Ship Hospitals in Long Reach, and the temporary hospital at Darenth. Having in view these exceptional circumstances, and considering also the enormous area and population with which the Metropolitan Asylums Board have to deal, it will be desirable to consider the fever and small-pox hospitals of London by themselves, dividing them into two sections consisting of (1), the two older hospitals at Islington and Highgate, which are in part supported by voluntary contributions; and (2) the hospitals under the control of the Metropolitan Asylums Board.

The London Fever Hospital.—The early history of this hospital has been already briefly sketched. The plan as it originally stood shows two internal courtyards almost closed in by buildings. The front of the hospital faces west, and the central portion, which is three storeys high, contains the residences for medical officers and matron, bedrooms for nurses and servants, and the kitchen offices. The wings which connect this building with those at right angles are one storey only, and are cut through on each side by the carriage entrances for the ambulance. The connecting corridors, also, being partly open to the air at their sides, atmospheric connection between the central block and the ward blocks is completely severed. The blocks which run east and west, and form respectively the north and south boundaries of the two courtyards, contain the scarlet fever wards. In the front portion are, on each side, four private rooms,—two on the ground, and two on the first floor. The back portion contains two large wards, divided from each other

by a wall pierced at intervals with arched openings. One of these wards is in each case two storeys high, the upper floor of the northern block being a ward, and that of the southern block being occupied by the day-room and cubicles for nurses. At right angles to each of these blocks is a one-storey ward for 12 beds. These wards constitute the accommodation available for scarlatina, 120 beds in all. The block which stands between the two last-mentioned blocks contains the laundry and engine-house. To the east of this is a small detached building containing the dead-house, post-mortem room, and disinfecting chamber. The building projecting eastwards from the southern block contains four wards, divided transversely by a bath-room entrance and ward scullery into two, and each set of two divided longitudinally by iron columns and a dwarf wood screen. These wards are used for typhoid fever or measles. They were erected in 1864. In 1863 a similar block had been erected on the north side, but this was pulled down in 1871. In 1869 some temporary wards were erected between these two wings, and they also were removed in 1871. In 1883 the small building near the north-east angle was erected as the beginning of a larger block to provide additional accommodation for private patients and for measles. Only three rooms are contained in the part built, and they are used as isolation rooms for doubtful cases. They are lined throughout with glazed bricks, and have solid concrete floors, finished with oak blocks which are treated by the paraffin process. The work of disinfecting one of these rooms, therefore, is a very simple and inexpensive operation. At each side of the entrance gate is a lodge, one being occupied by the secretary's office, the other by the engineer. At the back gate, also, is a lodge occupied by the gardener. The ventilation of the wards was, when the hospital was erected, performed by a fan, which was so arranged that air could either be forced in or drawn out as required. The fan was placed in the engine-house, and large trunks ran thence to the wards, where they distributed the air into smaller ducts leading to the side walls and central divisions. This apparatus has long ceased to exist, and the simple process of opening windows has been found to answer every purpose. The wards, though not of a form that would be regarded nowadays as the best, are most undoubtedly airy and easily ventilated, and the results obtained do not by any means suggest any defect in the structure. The work of the London Fever Hospital up to the year 1871 was concerned almost exclusively

with the poorer classes, and typhus and relapsing fever both figure largely in the reports. The constitution of the Metropolitan Asylums Board and the consequent removal of all patients of the pauper class, materially changed the work of the hospital; and in the latter part of the year 1871 the eight private rooms for paying patients were opened. Two classes of patients are now admitted—private or paying patients, who occupy private rooms and pay a fee of £3 3s. per week as an inclusive charge; and ward patients, who may be (*a*) domestic servants of governors, admitted free, (*β*) employés of large firms or others who subscribe according to a definite scale and have the privilege of free admissions according to the amount of their subscriptions, or (*γ*) any other persons who, not being paupers, can pay the requisite fee of £3 3s. for the whole term of their stay in the hospital. The cases admitted to the wards—and they form of course the great majority—cost the hospital about £8 in addition to the fee paid. Moreover, during the year a large proportion of the fees are either reduced or wholly remitted. The deficiency is made up by subscriptions and donations.

Small-pox and Vaccination Hospital, Highgate.—Of this hospital we have unfortunately been unable to obtain any information. The hospital was originally established at King's Cross in a building which is said by Dr. Bristowe to have been of radically bad construction. On the purchase of the premises at King's Cross by the Great Northern Railway Company about 1852, the hospital was removed to the building at Highgate, where it has ever since remained. The accommodation is about 100 beds, and patients either pay a fixed sum of £4 4s. for their treatment or are admitted free on a governor's order.

(*a*) *Hospitals of the Metropolitan Asylums Board.*

The fever hospitals under the control of the Metropolitan Asylums Board are: the Eastern (Homerton), South-Eastern (New Cross), South-Western (Stockwell), Western (Fulham), North-Western (Hampstead), North-Eastern (Tottenham), and Northern (Winchmore Hill). Of these the first six are for acute cases, the last for convalescent patients. The table on page 260 gives the area of site and number of patients approved by the Local Government Board in each of the acute hospitals.

The Eastern and South-Western Hospitals are permanent buildings planned on the pavilion system with two-storey wards. Both were originally designed with two separate and distinct hospi-

tals—one for small-pox, the other for fever—each hospital having its own staff and being entirely self-contained in every way. For some years past the small-pox hospital has in each case been disused as such, and both at Homerton and at Stockwell the two hospitals have become one for the reception of fever cases only. As typical of the arrangements thought desirable some twenty-five years ago, we give a block plan of the Eastern Hospital at Homerton. The buildings have been considerably altered since the hospital was first erected, but the general main lines remain. The group of buildings to the north of the road, which roughly bisects the site from east to west, formed the fever hospital, those to the south of this line the small-pox hospital. To both hospitals there was but one entrance—that at the extreme south-west corner of the site in the Grove. It will be seen, therefore, that through this one entrance all the persons visiting either hospital would have to pass, whatever might be their business. Further, it is to be noted that the whole of the administration offices were placed in the centre of the site, and that everyone whose business it was either to deliver stores or supplies or to see the stewards would have to pass in more or less close proximity to some of the wards. The residences, also, for the medical officers and for the stewards were in these central blocks. The arrangements were in fact the very reverse of what they ought to be. Instead of the stores and the officers' residences being placed on the extreme boundary of the site, where they could be approached without passing or coming into the near neighbourhood of the patients' quarters, they were placed in the very centre of the land between the cross-fire, so to speak, of the different infections. And, to make matters worse, the laundry building of the small-pox hospital was placed within some 20 ft. of the public street. The latter building, together with the kitchen offices adjoining, have recently been demolished, and a new building is in course of erection which will contain steward's stores and the main entrance to the hospital, with a waiting-room for visitors, and nurses' rooms above. By this alteration persons having business with the steward or delivering supplies will not have to go into the near neighbourhood of any wards, and will, so to speak, hardly get beyond the threshold of the site. Of the general arrangements of the wards there is little to be said. Ample cubic space (over 2,000 ft.) is allowed, and the distance between the blocks is sufficient. The buildings as originally completed were very deficient in suitable accommodation for the

staff; but this defect was subsequently remedied, and on the whole the hospital may be said to fulfil its purpose fairly well.

The South-Western Hospital at Stockwell is planned somewhat differently to the Eastern Hospital at Homerton, the difference being due to the form of the site, which is long and narrow. The wards in this case are placed in one parallel line on one side of a long corridor, except the typhus wing, which is a later addition, and projects from the other side of the corridor. As might be expected, a group of buildings planned to form two separate self-contained hospitals does not lend itself readily to conversion to one hospital.

Northern Hospital, Winchmore Hill, N.—This, the convalescent hospital of the Asylums Board, occupies a site of $36\frac{1}{2}$ acres on high land in the north of London. It was built in 1890, and has certified accommodation for 480 beds. The buildings are all detached, and comprise a large central administration block, detached houses for steward and gardener, mortuary, and sixteen pavilions for patients. The administration block contains the quarters for two resident medical officers, the nursing staff, and servants, with the kitchen offices and the laundry. The ward pavilions are built upon two plans slightly differing from each other. In one case the wards are placed at right angles, in the other they are in a line, but in each case the general form of the pavilion is that of a T. Each pavilion contains upon the ground floor two day-rooms, a kitchen, large store-room, pantry, lavatory, and attendants' sitting-room. On the upper floor are two wards for sixteen beds each, with a bedroom for charge nurse, two bathrooms, and a linen closet. Attached to each ward are a water-closet and sink, with an intervening ventilating lobby. Large airing-courts are attached to each pavilion, laid down in grass, and with tar-paved paths, and each has a verandah on the airing-court side connecting the two day-rooms.

The North-Western Hospital was originally put up in a great hurry to cope with an epidemic of small-pox, and consists partly of iron huts, partly of wooden huts, with a permanent brick residence for the medical superintendent.

The South-Eastern and Western Hospitals are not of the same type as the Eastern and South-Western Hospitals. Designed by the same hand and erected at about the same time, they were, when first completed, planned on very much the same lines. The main feature of these hospitals is the construction of the

wards. These are of one storey, and the sides, instead of being continuous brick walls, are formed with brick piers, with the interspaces filled in with wood framing and galvanised iron. The communication between the wards and the administration building are covered ways, open at the sides. The administration buildings are of a permanent character.

North-Eastern Hospital, St. Ann's Road, Tottenham.—This is a temporary hospital provided to meet the pressure of the scarlatina epidemic of 1892. In proof that the provision was sorely needed, it will be sufficient to mention, that for some weeks before the hospital was ready to receive patients all the fever beds at the disposal of the managers were occupied, and patients had to be denied admission. Unfortunately, difficulties had been met with in the selection of the site, and delays had taken place at various stages of the negotiations, but as soon as the matter was finally settled, in August 1892, the work of putting up and furnishing the new hospital was rapidly proceeded with, under the supervision of Messrs. A. & C. Harston, the architects, and on October 8, or within seven weeks from the commencement of the work, patients were admitted. The hospital comprises fifty buildings, all of wood except the boiler-house, coal-store, and heating-rooms. There are twenty-two ordinary patients' blocks, two isolation blocks, two administration blocks, seven dormitory blocks for female staff, besides blocks for stores, laundry, kitchen, &c. Accommodation is provided for 456 patients, with an allowance of 144 ft., each of superficial space; but in case of emergency 548 patients would be admitted, when the space for each patient would be reduced to 120 superficial ft. The site, which is nearly nineteen acres in extent, is enclosed by a fence seven feet high, except along St. Ann's Road, where a wall 800 ft. in length has been built.

Hospital Ships, Long Reach.—Practically all cases of small-pox in London requiring to be isolated are now sent to the Hospital Ships, *Atlas*, *Castalia*, *Endymion*, which are moored in the Thames at Long Reach, some fourteen miles below Greenwich, and provide accommodation for 350 patients on board the two former vessels, whilst the *Endymion* serves for administration purposes. Connected with these ships is an excellent service of ambulance steamers. Altogether the arrangements are very complete and satisfactory.

An Ambulance Station.—Ambulance stations are provided

at three of the Asylums Board Hospitals—Deptford, Homerton, and Fulham. As an example which will serve for all, we give a plan of the station adjoining the Eastern Hospital at Homerton. The buildings are for the most part two storeys in height, and are ranged along two sides of a courtyard. In the front, facing the Grove, is the residence of the superintendent. Besides the provision made for horses and ambulances, there are day-rooms and sleeping quarters for the men and for the nurses, bath-rooms, a laundry, and workshops.

Hospitals of the Metropolitan Asylums Board.

Name.	Area.			Beds.	Area per Bed.
	A.	R.	P.		
Eastern	8	0	25	472	731'55
South-Eastern	9	2	0	462	895'71
South-Western	8	0	0	340	1,024'94
Western	6	1	14	224	1,232'59
North-Western	11	0	0	443	1,081'62
Hospital Ships	—			350	—
Northern (Winchmore Hill) Hospital for Convalescents	36	2	0	480	3,312'37

(b) Provincial Infectious Hospitals.

In the Report by Dr. Thorne Thorne on infectious hospitals, to which reference has already been made, it is recorded that sixty-seven hospitals in all were visited, in the use or professed use of which 150 different sanitary authorities were concerned. An analysis of the report shows that of these sixty-seven hospitals only nineteen were erected expressly for the purpose they have to serve and in a permanent way; sixteen were wholly or in part of wood; five were wholly or in part of iron; one was a tent hospital; one a floating or ship hospital; seven were workhouse infirmaries or wards of general hospitals; and the remainder consisted of old villas, semi-detached houses, and cottages adapted to the purpose. In one case an old cotton mill, and in another an old brewery, was made to do duty. The conclusion to which Dr. Thorne comes is that the permanent usefulness of a hospital is largely dependent on the circumstances under which it is erected. Hospitals erected during the passing influence of a panic are frequently not ready for use until the immediate cause of the panic is over and gone. When erected, such buildings generally turn out to be unfit for their purpose and useless as sanitary defences against epidemics. And

finally, the cost of buildings put up under these conditions is often needlessly out of proportion to the accommodation provided. On the other hand, carefully thought out plans prepared in non-epidemic times, and carried out without the added stimulus of epidemic, real or threatened, will be found to afford accommodation of such a kind as is most needed to protect the community from the spread of disease. Instances could be multiplied to an almost indefinite extent where the isolation of one or two cases of fever would certainly have averted a disastrous outbreak. It is just these initial cases that it is of the most vital importance to isolate promptly. Fevers of all kinds are constantly imported into towns by tramps or other casual visitors, and the prompt isolation of a wandering case of scarlatina will often save a whole population from the chance of infection. The importance of this cannot be overrated; but in proportion to its importance is the difficulty of convincing people of its truth. It is a very difficult task to demonstrate clearly to the average rate-paying mind that if one or two cases of scarlatina are treated in the course of the year in the isolation hospital, the cost of keeping up the establishment during all the rest of the year was far more than counterbalanced by the saving which was effected by having warded off the possibility of an epidemic.

The Belvedere Hospital is the infectious diseases hospital for the city of Glasgow. It occupies a site of $31\frac{1}{2}$ acres at the eastern limit of the city, which is bounded on the south-west by the River Clyde, and consists of two distinct hospitals, one for small-pox, the other for fever. The wards are all arranged in one-storey detached pavilions, each accommodating thirty-four patients. Each block is divided transversely by a wall into two equal parts. In each part is a large or "acute" ward for twelve beds, and a convalescent ward for five beds. Projecting from the centre of one side of the acute ward is a nurse's room, the wall of which projects into the ward and has two windows overlooking the ward. On the other side is the entrance lobby, which serves also as disconnecting lobby to water-closet, sink-room, bath-room, and pantry. Five of these pavilions are devoted to small-pox, the remaining eleven to fever; and each hospital has its own kitchen offices, washhouse, and residences for staff. All these buildings are entirely detached, there being no covered communication whatever between any of the blocks. At one corner of the site is a large washhouse for washing and disinfecting clothes, &c., belonging to patients who have been treated in private houses.

Bradford Fever Hospital.—This hospital owes its origin (*vide* Dr. Thorne's report) to gifts of £9,000 made by anonymous donors to the board of management of the Bradford Infirmary. By additional contributions a total of £22,500 was raised, and the present buildings designed by Messrs. Andrews and Pepper were erected. The hospital stands on a site of nearly eight acres, and contains in all sixty-eight beds. The buildings consist of an administrative block three storeys high, containing the usual offices and the residential quarters for the staff, seven ward pavilions, a detached washhouse, an ambulance shed and stabling, a mortuary block, and a disinfecting house. Six of the ward pavilions are connected to the administrative block by corridors; three of these pavilions contain each a ward 55 ft. 6 in. long, 27 ft. wide, a nurse's room, a scullery, and a small ward 17 ft. by 10 ft. The large wards contain each ten beds; the small wards are intended either as isolation wards, or for paying patients, and have one bed each. The ward floors are of oak, and the walls are lined with parian cement. The windows are opposite one another, but do not appear to have adequate means of opening. Ventilation is also provided for by means of openings just above the floor level, Sherringham's ventilators just below the wall plate, and a large shaft fitted with a diaphragm opening out through the ceiling above the roof. Two stoves are placed on the central line of the wards, and have descending flues. The baths are placed in the centre of the wards, and when not in use are covered over and serve as tables. Three smaller pavilions contain each a ward 27 ft. by 22 ft. 6 in., with four beds. The seventh pavilion, which is devoted to scarlatina, is connected to the administration block by a covered way divided down the centre by a partition of wood and glass. Two distinct covered ways are thus formed, either of which can be used in wet weather, according as the wind sets in one or another direction. The scarlatina pavilion contains two wards for nine patients each, four private wards for single patients, two small wards of two beds each for acute cases, a nurse's day-room, and, on an upper floor over the central portion, nurses' bedrooms. The disinfecting apparatus in use is Dr. Ransome's gas oven.

Since the foregoing description was written, a pavilion for the treatment of small-pox has been erected to the north of the older hospital. In this building a scheme of ventilation has been adopted which is in some sort a development of Professor Burdon Sanderson's scheme, and has been patented by the inventors, Messrs.

Morley & Woodhouse, the architects. The object aimed at by the inventors is to secure the complete destruction of all infective matter which passes out of the wards. We give the description of the process in the inventors' own words: "The hospital is constructed on such a system that all foul air is passed through heat sufficient to destroy all germs before it reaches the outer air, and so prevent the spread of infection from small-pox to the surrounding district. The hospital has two wards back to back, and between the two is a space of 3 ft. carried up the whole height of the building; the windows are all made fast, and the fresh air is brought in by flues into a compartment at the bottom of the centre space; this space is covered over with flags with open joints, and above is another compartment which contains a long coil of heating pipes the whole length; from this second compartment, or heating chamber, flues are conducted to gratings in the floor of the wards at the foot of each bed. Thus it will be seen that the fresh air has to pass through the second compartment or heating chamber, and therefore in the winter the fresh air is warmed before entering the wards. Above the second or heating chamber is another compartment made perfectly air-tight from the compartment below, and this is a foul-air chamber which goes out at one end through a powerful fire-brick furnace, made in compartments with honeycomb bricks so as to check the air and retain it a certain time in the heat before it passes out into the open air. Into this foul-air flue are openings at the ceiling level of the ward, and over each bed. Thus the process is: the fresh-air (warmed in winter) passes from outside through the heating chamber and thence into the wards through the gratings at foot of beds; the foul air is then drawn out at the openings at ceiling level into the foul-air flue, and passes through the furnace and into the outer air by means of a tall chimney. At least 7,500 cubic ft. of air per hour per patient passes through the ward and out into the open, and the heat of the furnace is 700° Fahr., being more than sufficient to destroy all germs. The temperature in winter will get up to about 60°. The working of the apparatus and system has been tested (of course without patients), and has been found to give over 9,000 cubic ft. of air per hour per patient, and a heat of 63° Fahr." The object of this scheme is undoubtedly a laudable one, and if it succeeds in accomplishing the end in view it will be most valuable. But before its success or failure can be determined with certainty, some very different experiments to those described by the authors

must be undertaken. The crucial test upon the issue of which the scheme must stand or fall is whether the air, when it has passed through the furnace, is so sterilised that all organic life has been destroyed in it. This, and this alone, is the test that must be applied, inasmuch as the whole object of the scheme is to render it impossible for disease germs to pass from the wards to the outer air. The result of this interesting experiment will be looked for anxiously.

The Bolton Borough Hospital was opened for the reception of patients in September 1883. The plan is on the detached pavilion system, and, as far as it goes, is a good example of the modern mode of arranging infectious hospitals. The site is 19,110 sq. yds. in area, and the buildings are four in number. The entrance is on the eastern side, and the administration block occupies the central portion of the site, immediately opposite the entrance. This block is two storeys in height, and contains the residences for the medical officer and nursing staff. An open covered way, consisting only of a roof supported on posts, connects the administration block with two ward blocks. These latter are in every respect identical, one with the other. At the entrance is a covered porch, under which the ambulance drives to set down patients. On one side of the entrance is a small ward scullery, on the other a linen-store; immediately opposite is a nurses' sitting-room. The wards, two in number, contain six beds for adults and one cot. To each patient is allotted 144 ft. of floor area and 2,080 cubic ft. The floors are of pitch pine, French polished, and the walls and ceilings of selenitic cement coated with calcarium. The wards are provided with Shorland's ventilating stoves with descending flues. Fresh warmed air is also introduced into the wards through valves placed under and over each bed; these valves are fitted with movable filters, and are arranged also to admit of disinfectants being used. Water-pipes are carried in a trench under the floor to provide for the cooling of the air in summer and warming in winter. The wards face north and south, and on the south side are verandahs, entered from passages off the wards. Each ward has attached to it a convalescent-room with a bay window looking south. The bath-rooms, sinks, and earth-closets are placed in projecting buildings with cross-ventilated lobbies. The rain-water is all collected into a pond at the south end of the site, into which the slop-water from sinks and baths, after undergoing a process of disinfection and filtration, is also discharged. The excreta from the earth-closets

is destroyed in a furnace. The laundry and mortuary are placed at the south-west angle of the site.

City Hospital for Infectious Diseases, Newcastle-upon-Tyne.—This hospital is situated about three miles from the centre of the city, on a site of about eleven acres in extent. The buildings consist of a main administration block, four general ward pavilions, an isolation block, a laundry, a disinfection house, a mortuary, an ambulance shed, and porter's lodge. All these buildings are detached, the main administration building and the general ward pavilion only being connected with each other by covered corridors open at the sides. Space is left for the addition of two more general ward pavilions at a future time. The administration block consists of two buildings—the front portion facing the entrance contains the resident officer's quarters (matron, resident medical officer, and nurses), and the back part the kitchen, offices, and laundry for officers. Each ward pavilion contains two large wards for ten beds each, separated by the entrance lobby and the nurses' duty-room, and two separation wards of one bed each. At the entrance to the pavilion is a waiting-room for receiving and discharging patients, next to which is the board scullery. On the other side of the corridor is a small yard in which are a water-closet for nurses, and the coal-store. The ward water-closets and bathrooms are placed in wings projecting at each side of the further end of the ward. The isolation block is an almost exact reproduction of the Local Government Board's model block, and contains on each side a nurse's room between two wards—one for two beds, the other for one bed.

Delancey Hospital, Cheltenham.—This hospital, though it practically is the isolation hospital for the town of Cheltenham, is not the property of the Urban Sanitary Authority, but is in the hands of trustees. It owes its origin to the benevolent intention of Miss Delancey, who on her deathbed expressed a desire to set apart a sum of £ 5,000 for the purposes of a Fever Hospital. The bequest, however, coming under the operation of the Statute of Mortmain, was void ; and that the scheme ultimately took shape is due to the action of three of the legatees of Miss Delancey's will, who, declining to avail themselves of their legal rights, handed over their shares to the trustees on the conditions that the money should be devoted to the purposes intended by Miss Delancey, and that the hospital should at once be begun. With the aid of subscriptions and several large donations from the Rev. J. H. L. Gabell, a site was purchased

and the existing buildings erected. The site consists of six acres of land just outside the limits of the borough. Upon it are erected three groups of buildings, detached from each other by large intervening spaces. The northernmost group consists of the administration block and the scarlatina block. These are separate buildings, but are connected together by a closed-in corridor. The administration block contains the accommodation for resident staff and the kitchen offices. Of the complete scarlatina block only the central portion has been erected. This comprises, on the ground floor, four wards of one bed each for male patients, and four for female patients, two nurses' bedrooms, a bath-room, two small sculleries, and three water-closets. These wards vary in size from 16 ft. 3 in. by 13 ft., to 15 ft. by 13 ft., and are all 13 ft. high. They are intended for paying patients. On the upper floor are two large wards, now used for public patients (that is, patients sent in by sanitary authority), each 40 ft. by 23 ft. The ultimate destination of these wards is for convalescent patients. A third ward, which is now used for convalescents, occupies the central front portion of this floor, and is 34 ft. long by 15 ft. wide. The rest of the floor is occupied by nurse's room, bath-room, scullery, and linen closet, and an open ventilating area which provides some amount of cross-ventilation to the central ward. In the future it is intended to build one-storey wards on each side of the central block, each ward to accommodate twelve beds. At a distance of over 300 ft. from the scarlatina pavilion is a one-storey building devoted to small-pox. It contains two general wards for four beds, each 24 ft. by 24 ft., two private wards 15 ft. by 12 ft., two convalescent wards 24 ft. by 12 ft., a nurse's room with small scullery, bath-room, larder, and the necessary water-closets. About midway between the scarlatina block and the small-pox block it is intended to erect two pavilions detached from each other by a few feet—one for typhoid, the other for typhus. The third group of buildings consists of the laundry, dead-house, and drying-shed. Beneath part of the laundry is a disinfecting chamber. In point of architectural appearance the buildings are much more elaborate than would be generally regarded as desirable or necessary in a fever hospital supported by the rates. The present is, however, a special case, inasmuch as a considerable part of the accommodation is intended for paying patients; and owing to the fact of Cheltenham being a health resort, and a large portion of the population being of a well-to-do class, the accommodation thus provided should be of a superior

kind. The charge for patients in private wards is 10s. 6d. per day, exclusive of medical attendance or of special nursing, and patients are allowed to choose their own medical advisers. Small-pox patients from within the area of Cheltenham Union are charged 2s. 6d. per day, and scarlatina patients 3s. per day. Domestic servants of subscribers of not less than one guinea per annum are admitted free.

Gateshead Isolation Hospital.—This hospital belongs to the Urban Sanitary Authority of Gateshead, and is maintained, therefore, by the rates. It consists of two pavilions of two wards each, 100 ft. apart. Centrally between the two is the administration block, which is of two storeys, and contains the kitchen, offices, and residences for officers. At the back of this block, and separated from it by a yard, is a one-storey block, containing washhouse, disinfecting-house, dead-house, and ambulance shed. The washhouse is of the most meagre description, and there is no means of separating clean from dirty linen. In the disinfecting-house, also, it does not appear that any provision is made for separating infected from disinfected clothing. The ward blocks have each two wards, each ward containing eight beds. The width of the wards is 24 ft., the length 48 ft., and the height 16 ft.; the area per bed being 144 ft., and the cubic space 2,304 ft. The wards are divided from each other by four rooms, being respectively nurse's room, store-room, scullery, and bath-room, and projecting from the side of each block in the centre is a convalescent room. The communication between the administration block and the wards is by means of covered ways, consisting simply of a roof supported in parts. As an isolation hospital this plan cannot be regarded as fulfilling its purpose. There is no provision whatever for isolating even one doubtful case. Assuming that one pavilion was appropriated to one disease for both sexes, and the other to a different disease, also for both sexes (which does not seem to be the case), it would only be possible to treat two diseases simultaneously. The administration block also is much too close to the wards, and, as a consequence, all persons whose business brings them to the hospital are obliged to pass within a very short distance of the ward windows.

The Heathcote Hospital, Leamington.—This hospital was erected in 1889 by the Warwick Joint Hospital Board, the constituent authorities being the urban districts of Leamington Spa, Warwick, Kenilworth, Lillington, and Milverton, and the

rural sanitary district of Warwick Union. Since the formation of the joint district the districts of Lillington and Milverton have been amalgamated with the Borough of Leamington. The site is 6 acres in extent, $2\frac{1}{2}$ acres of which are enclosed and appropriated to the hospital use. It stands on high ground in the middle of open fields, and is about midway between the towns of Warwick and Leamington. The population within the joint district was, when the hospital was erected, about 55,000, and of this number some 44,000 were within a radius of three miles from the hospital site. The area of the district is 44,507 acres, and its rateable value £340,000. The accommodation provided is equal to one bed for every 2,000 of population. The buildings are four in number, and each is entirely detached from the remainder. They are: (1) the administration block; (2) the isolation block; (3) the ward block; and (4) the laundry block. The site is enclosed on three sides by a high wooden fence, the front towards the high road having a dwarf wall and an iron railing. The two blocks occupied by patients and the laundry block are each 40 ft. distant from the boundary, and an inner fence at a distance of 40 ft. from the front gates prevents patients from approaching too near the latter.

The administration block is, alone of the four buildings, two storeys in height, the rest being one storey only. It contains on the ground floor a sitting-room for the matron and nurses, a room, with lavatory and water-closet attached, for medical officers, linen-room, water-closet for nurses, kitchen, scullery, and larder, with wood- and coal-stores and servants' water-closet in the yard. At one corner of the kitchen is a serving hatch, opening into a covered porch, at which the meals for the patients are given out. On the upper floor are bedrooms for the matron, nurses, and servants, and a bath-room.

The isolation block is divided into two equal parts by a wall, and the arrangements on one side of the wall are an exact counterpart of those on the other side, the entrance to one side being on the east, and that to the other side on the west. Each half of the building, therefore, contains a large ward for three beds, two small wards for one bed each, a nurses' duty-room, and a water-closet and slop sink. These rooms communicate with each other by way of an open verandah, roofed over at the top, but quite open in front. Each large ward is 36 ft. long by 18 ft. wide, the smaller wards being 18 ft. by 12 ft., and all are 12 ft. high. The allowance of floor space is 216 ft. per bed, and of cubic

space, 2,592 ft. per bed. The large wards are lighted by three windows at each end, the smaller ones by one window on each side, being in the proportion of 1 sq. ft. of window surface to about 65 ft. of cubic space. The windows, which form the principal means of ventilation, are divided into two parts by a transom, which is fixed about 1 ft. 6 in. from the head of the frame. Below the transom are ordinary double-hung sashes, provided with a deep bottom rail and a sill board, which permits of the lower sash being raised, and a current of air admitted in a vertical direction between the two sashes, at the same time preventing the free access of air at the sill level. Above the transom is a "hopper light," hung on hinges at the bottom to fall inwards, and provided with glazed cheeks at the sides to prevent down-draughts. In addition to the windows, openings are made at the floor level behind each bed, and provided with Ellison's radiator ventilators; there is also an extraction flue in each ward, carried up alongside the smoke-flue, from which it is separated by iron plates. The inlet to the flue is at the ceiling level, and a Bunsen burner is provided, with a view to produce an upward current when the fire is not lighted. The wards are each provided with a Boyd's hygiastic ventilating grate. These grates have at the back of the fire an air-chamber, which is supplied with fresh air from the outside. The air, being warmed by contact with the heated fire-brick back of the stove, passes into the room through a grating above the fire-place. The walls of the wards are lined to a height of 5 ft. with tinted glazed bricks, above which they are plastered and dis-tempered. The floors are laid with yellow deal in 3-in. widths, ploughed and tongued. The vertical angles of the walls, the horizontal angles at the junction of floors and walls and of walls and ceilings, are all rounded; so also are all the angles of door-panels, and of the windows; and in the finishings of the doors and windows rounded fillets only are used, no recessed mouldings being used anywhere. The nurses' duty-room is provided with a small range with oven and boiler, and hot water is laid on from the latter to the sink, the movable bath in corridor, and the slop-sink. There is also in this room a small dresser and a glazed porcelain sink. Outside the duty-room is a recess, where the movable bath stands. A glazed fire-clay sink let into the floor takes the waste, and taps fixed to the wall afford the supply of hot and cold water. The water-closet and slop sink are placed in projecting buildings, entered from the verandah. The walls of these offices are lined

with glazed bricks, and the floors are of cement. The slop sinks are of porcelain, provided with a flushing-rim in addition to the hot and cold water taps. The closets are Hellyer's pedestal hygienic, the trap and basin being made in one piece of porcelain, and are fitted with three-gallon flushing cisterns and hard wood rim seats, hinged at the back.

Ward Block.—This building is entered from the centre, and affords accommodation for twelve patients, all of one disease, the beds being equally divided between the two sexes. In the open porch at the entrance are two doors: one of these gives access to the entrance lobby, the other is an outer door to the bath-room. The object of the latter is to enable a patient, on being discharged, to leave the building directly from the bath-room. The bath-room thus becomes the discharging-room,—not, perhaps, an ideally perfect arrangement, but certainly a better one than if the patient had to re-enter the ward after his final bath. To the left of the entrance is a smaller cupboard with a window for food, and opposite are cupboards for patients' clothes and linen. Between the wards is the nurses' duty-room, in which is a small range, with boiler for supplying hot water to the baths, sinks, and lavatory basins, a dresser, and a porcelain sink. The wards are each of them 36 ft. long and 26 ft. wide, and contain six beds each. To each bed is allotted a floor-space of 156 ft. and a cubic space of 2,028 ft., and the distance from centre to centre of each bed is 12 ft. The window area is in the proportion of about 1 ft. of window to every 60 ft. of cubic space. The means of ventilation are similar to those adopted in the isolation block. The grates also are similar, but in these wards they are placed in pairs, back to back, in the centre of the floor, with descending flues carried under the floor to vertical chimneys in the outer wall. The latter are swept from the outside. The water-closets and slop sinks are placed in the projecting buildings at the ends of the wards, from which they are separated by cross-ventilated lobbies. The construction of these wards as regards internal finishings of floors and wall-surfaces, &c., is in all respects similar to that of the isolation block. A speaking-tube connects the duty-room with the administration block.

The laundry consists of a washhouse, fitted with the usual appliances for washing, an ironing-room, and a drying-room, heated by the flue of the ironing-stove, and fitted with a radial drying-horse. Adjoining are a water-closet and a coal-store. The disinfecting-house is divided into two parts by a brick wall. The apparatus,

which is one of Washington Lyon's high-pressure steam machines, projects on each side of this wall, so that the infected clothes are put in in one chamber, and when disinfected are taken out by the door in the other chamber. The mortuary is a plain sky-lighted room, arranged for use when necessary as a post-mortem room. The ambulance house affords accommodation for one horse-ambulance.

Drainage and Water-supply.—The drainage system is a dual one, the rain-water being kept apart from the sewage and stored in a tank for use. The drains are all laid with glazed stoneware pipes, jointed with cement, with manholes at each junction and change of direction. Each length of pipe between the manholes was separately tested with water before being covered up, and all the pipes are laid on and partly embedded in concrete. At the head of every length of drain is a Doulton's 30-gallon automatic flushing-tank, and at the outfall to the public sewer is a large flushing-tank, fixed by the town authorities. These flushing-tanks were specially necessary in this case, as not only the quantity of sewage discharged at one time is necessarily small, but the sewer conveying the hospital sewage to the town sewers has to traverse a long distance before it comes near any other buildings. The soil-pipes are carried up above the eaves of roofs their full diameter as ventilating shafts. The rain-water from the roofs is all collected into an underground tank, after passing through a filter-chamber, formed partly of coarse and fine gravel and partly of charcoal. From the tank it is pumped for use in the scullery of the administration block and the washhouse.

The cost of the hospital was as follows :—

	£	s.	d.
1. Land	900	0	0
2. Buildings, including laundry fittings, disinfecting apparatus, roads, paths, fences, drains, and professional charges	7,635	10	6
3. Gas mains from nearest point up to site	84	4	4
4. Water mains	161	10	11
5. Sewer	299	4	9
6. Furniture	293	17	7
Total	<u>9,374</u>	<u>8</u>	<u>1</u>

Hull Corporation Sanatorium.—This hospital occupies a site about a mile distant from the town and close to the banks of the Humber. It consists of a group of isolated buildings, connected together by roads only. The site, which is of irregular form, is connected with the main road by a long and narrow strip of land, at the entrance to which is the lodge. The roadway runs along the centre of this narrow strip until it reaches the point where the site broadens out. It then branches off to the left to the administration block, and continues its original course to the typhoid block, and then to the small-pox block. On the side of the roadway, before the land widens out, are placed at intervals the mortuary and the washhouse. The administration building contains the kitchen offices and stores, two waiting-rooms, and bedrooms for staff. At the back of this block a covered way gives access to a small block of two wards for probationary cases. The scarlet fever block is two storeys in height, and contains on the ground floor four rooms for private patients, two nurses' rooms, bath-room, waiting-room, day-room, and general ward for eight beds. Two wings, placed angle-wise, project from each angle of the free end of the ward, one being a nurse's room, the other bath-room and water-closet. In each case there is a separating cross-ventilated lobby. The upper floor is similar to the ground, but has one additional private patient's room. The typhoid and small-pox blocks are much smaller, are one storey only in height, and contain general wards and ward offices only.

The Infectious Hospital for the Joint Counties Asylum, Carmarthen, was erected in 1878. In plan it belongs to the Class IB, or double pavilion. The administration offices occupy the centre, the kitchen offices projecting at the back. On each side of the latter a covered way leads to the laundry, separated by an open yard from the kitchen offices, and to two mortuaries. The ward blocks communicate by corridors with the central block, and contain each two wards, one for four beds, the other for six. These wards communicate by folding doors. Attached to each ward block is an attendant's room, a convalescent room, ward scullery, water-closets, and bath-room.

The Isolation Hospital at Huddersfield is the old workhouse and infirmary with a new ward pavilion built expressly. With regard to the older portions, Dr. Thorne (*op. cit.*) reports that the rooms are of low pitch, are not provided with means of cross-ventilation, and that the water-closets are either in direct communication

with the wards, or only imperfectly disconnected. The new ward pavilion contains two wards of ten beds each, with rooms for nurses and convalescent rooms on an upper floor. The water-closets are only imperfectly disconnected from the wards.

The Isolation Hospital for the Borough of Oldham consists, partly of wooden, partly of permanent structures. At the time of Dr. Thorne's visit the buildings consisted of the hospital proper, which comprised the administrative offices and three ward pavilions, a porter's lodge, a laundry, and a mortuary. These buildings are all constructed of wood, on brick foundations. In 1883 a permanent block building was erected, two storeys in height, and containing two wards for ten beds each on each floor. The nurse's room occupies the centre of the block, and separates the male from the female side. The upper wards are intended for convalescent cases. In the wooden hospital are three private wards for paying patients. The floor space in the wooden pavilions is 168·75 feet, and the cubic space 2,025 feet per bed. In the permanent structure the floor space is 107·5 feet, and the cubic space 1,505 feet per bed.

Isolation Hospital, Hornsey.—To the Local Board of Hornsey belongs the distinction of having been one of the first of the suburban sanitary authorities to provide itself with an efficient isolation hospital. The buildings consist of an administration block, a ward block, and a disinfecting-house and mortuary. The administration block is two storeys in height, and contains the residences for matron, nurses, and servants, kitchen offices and doctor's room, with small medicine store. The ward block is a simple reproduction of the Local Government Board's model plan, and has two sets of wards entered from opposite sides of the building. In each set is a ward for three beds, and another for two, with the nurses' room interposed. This block is one storey in height, and it is proposed in the future to erect a similar block opposite the present one.

Kendray Fever Hospital, Barnsley.—This isolation hospital was erected in 1889 by the Barnsley Corporation, from the designs of Messrs. Morley and Woodhouse. It is chiefly noteworthy as being an example in practice—we believe the first example in this country—of the theory propounded by Dr. Burdon Sanderson, before the Royal Commission on Infectious Hospitals. The buildings are all detached, and are five in number: (1) the administration block; (2) fever block; (3) small-pox block; (4) laundry; and (5) mortuary and ambulance-house. It is with regard to Block No. 3 that the principles advocated by Dr. Burdon

Sanderson are carried out. Block No. 1 is two storeys in height, and is bisected on the ground floor by the roadway of approach to the ward blocks—a particularly objectionable arrangement which might very easily have been avoided. This building contains the kitchen offices, and the quarters for matron, nurses, and servants. Block No. 2 is divided into two parts by a wall, on each side of which are two wards, one for three beds, the other for two beds, with a nurse's room between. These rooms are all connected together by an open verandah, and are planned very much on the model of the Local Government Board's isolation block. In this case, however, the two halves of the building are allocated to male and female patients respectively, and are apparently not intended to isolate different diseases. The entrance, therefore, to each section of the building is on the same side. The closets and sinks are placed within the verandah, and open directly opposite the doors of the smaller wards. Block No. 3 is intended for small-pox patients. The ward is, as suggested by Dr. Sanderson, annular in plan. The centre of the circle is occupied by the smoke flue, around which is an annular space, in which are placed Keeling's destructors, and through which the extraction flues from the wards pass on their way to the central smoke flue. The destructors are placed slightly below the level of the ward ceiling, and the flues are connected to openings over each bed. Fresh air is admitted through gratings in the outer wall of the ward, and the windows are fixed and are used for light only. The passage of air through the Keeling's ventilators is calculated to be at the rate of 3,000 cubic ft. per head per hour, and the temperature to which it is raised before passing into the outer air is 450° Fahr. The wards which occupy the outer annular space are 18 ft. wide. The beds are placed with their heads close to the inner wall; the patients, therefore, lie facing the windows. Half of the space is allotted to male patients, and half to female patients. The bath-rooms are formed within the circle, and the closets, which are only accessible through the bath-rooms, are built out, there being no attempt to detach the latter from the wards by the interposition of a lobby. On either side of the entrance to the block is a nurses' room, one for each ward; and in a small detached block connected by a covered way are a kitchen, scullery, and store. The success or failure of this block in attaining its object will be watched with much interest. It is at all events an intelligent attempt to carry into practice an important principle. The laundry and mortuary blocks present no special features, and are sufficiently explained by the plan.

The Ladywell Sanatorium, Borough of Salford.—The new hospital for infectious diseases for the Borough of Salford was erected in 1890–91, from the designs of Messrs. Maxwell and Tuke, and E. and F. Hewitt. The site has an area of about seven acres, and when the buildings are completed there will be accommodation for 232 patients, giving a site-area per bed of about 1,334 square feet. The main entrance is at the north-west angle of the site. To the right of the entrance gates is a two-storey building, part of which is the porter's lodge, with accommodation for a married porter, and the remainder quarters for the unmarried men employed about the hospital. On the left-hand side of the gates is a one-storey building, containing a waiting-room for visitors, and the discharge rooms for patients. The latter comprise an undressing-room, bath-room, and dressing-room. The administration block provides accommodation for the resident medical officers, the dispenser, the matron, and the nursing staff. It is three storeys in height, and faces east and west. The sitting-rooms for the officers are, as they should be, on the sunny side, and the closets are well disconnected from the main building. The ward blocks are at present five in number: two isolation blocks, and three ordinary ward blocks. The two blocks nearest the entrance are isolation blocks. They are each two storeys in height, and contain on each floor two wards of three beds, and two wards of two beds, with two nurses' duty-rooms separating the wards. These rooms are all entered from an open verandah facing west. The ward blocks are all alike, are two storeys in height, and contain on each floor an acute ward for six beds, and a convalescent ward for eighteen beds. Separating the two wards is a nurses' duty-room or ward scullery, a bath-room, and a linen-closet. The staircase and the closets are placed in a separate tower, connected with the main building by a cross-ventilated lobby. In the well of the staircase is a lift. To the west of the ward pavilions is the kitchen block, a two-storey building with a basement, which contains, besides the kitchen offices, the general stores, servants' hall, linen-rooms, and work-rooms. At the north-east corner of the site is a large range of buildings containing the laundry, disinfection-house, mortuary, and post-mortem room, ambulance-house and stable dwelling for the men employed in this department, and a waiting-room for mourners. The disinfection-house and sanitary laundry are intended for the treatment of infected clothing, &c., sent in from outside the hospital by order of the sanitary officer.

The Leeds House of Recovery is a charitable institution

founded in 1803, and is supported by voluntary contributions, and by grants from various Sanitary and Poor Law authorities. The present buildings were erected in 1846, and in plan belong to Class 3 or "Corridor Hospitals." The form of the plan is that of the letter **H**, with the central line long in proportion to the height of the sides, and with a wing projecting from it in the centre. The whole of the central part is taken up by the administration offices, the projecting wing being occupied by the kitchens and laundry. The sides are wards. These latter are for one to four beds each, and all open into a common corridor which Dr. Thorne describes as "well lighted and well ventilated." In connection with this arrangement it is interesting to note that no spread of infection has taken place from ward to ward, except when small-pox has been admitted. Dr. Thorne further records that during Dr. Bowkett's tenure of office of four years, no patient contracted any infectious disease in the hospital; a circumstance which he attributes to the free ventilation both of wards and corridors, and the careful ordering of laundry matters.

The Monsall Hospital at Manchester owes its origin to a gift of £9,000 from Mr. Robert Barnes, a former mayor. Before its erection in 1872, Manchester had practically no means of isolation for fever patients. The buildings are somewhat heterogeneous in their nature; they consist of: (1) Monsall house, the general administration block; (2) a detached block containing kitchens, day-rooms, and sleeping apartments for nurses; (3) a cottage containing servants' bedrooms; (4) the main hospital building; (5) three wooden pavilions; (6) a "cottage hospital"; (7) a brick pavilion; (8) two cottages for workmen; (9) entrance lodge, disinfecting-house, mortuary, laundry, ambulance shed, &c. The hospital is not of such a nature as to need a detailed description. In particular the wooden pavilions appear to be very ill suited to their purpose. The facts given above are extracted from Dr. Thorne's report.

The Netherfield Institution for Infectious Diseases was erected by public subscription, aided by a grant from the Corporation of Liverpool. The buildings were re-opened in 1872, and subsequently enlarged in 1880 and 1886. Admission to the hospital is on the following terms—first class, or patients who pay £3 3s. per week, and are entitled to a private room; second class, or patients who pay £1 1s. per week; third class, who pay 10s. 6d. per week; and fourth class, those who pay 7s. per week and are admitted with

the certificate of the medical officer to the Corporation. In plan the building must be classed with Corridor Hospitals (Class 3). The general form is that of a letter H, with one side slightly longer than the other. Centrally, between the two side pieces, is the administration block, in which the kitchen offices and residences for the staff are placed. This block is connected with the side blocks by covered ways, the central portion of which are open and unenclosed. The western, or smaller block, contains on the ground floor one ward for four males, and two wards each for two males; a ward for three females and two wards each for two females; a nurse's sitting-room and bedroom, two bath-rooms, two lavatories and water-closets for patients, and a lavatory and water-closet for the nurse. On the upper floor are two wards for six females and a day-room; a ward for nine females and one for five. The eastern block has, on the ground floor, one ward for ten males, and two wards for two each; two wards for two females each, one for three and one for four, with a nurse's room and bedroom and water-closets, bath-rooms, &c. On the upper floor are two male wards for ten beds each, one for twelve beds, and another for three, also a day-room, nurses' rooms, &c. In each block the staircases and corridors bring all the different wards into direct atmospheric communication, and only in the case of the larger wards is there any attempt at cross-ventilation. The closets also are not efficiently disconnected from the wards.

New City Hospital (South) Grafton Street, Liverpool.—

This hospital forms part of a complete scheme for dealing with infectious diseases in the city of Liverpool. It occupies a site nearly square in form, and bounded on three sides by streets, in the immediate neighbourhood of the docks. The buildings are six in number, and are all detached. The block in the centre of the south side of the site is administrative; the east and west blocks are ward blocks, the block immediately to the north of that for administration is the laundry, the block at the north-west angle is for isolation, and that at the north-east angle contains disinfection apparatus, &c. The administration building consists of a front block with two wings at the back joined together by the kitchen, a one-storey building, and enclosing a square courtyard. The front building contains, to the right of the central entrance, the office and resident medical officer's rooms. These latter are compact and well-arranged, and consist of sitting-room, bedroom, bath-room, and water-closet. To the left of the entrance are the matron's sitting-room and bedroom, linen stores, and sewing and mending room. The right wing contains

receiving-room for stores, with entrance for tradesmen, dairy, larder, pantry, and scullery, with staircase to men's quarters. The left wing contains lavatory and water-closet, nurses' refectory, servants' hall, and dispensary. The serving windows for the kitchen and dispensary are exactly opposite each other, and close to the outer door. The first floor of the front block and left wing is devoted to nurses' bedrooms, with a bath-room for their use. The servants' bedrooms are in the floor above in the front block. The upper floor of the right wing contains bedrooms for porter, engineer, and stoker, with a water-closet and bath-room, and has no communication with the front portion. The two ward blocks are identical in plan. They are two storeys in height, and each contains two wards for eight beds each, divided by a nurses' duty-room and an entrance hall. At the entrance to each block is a waiting-room, separated from the block by a lobby with cross-ventilation, and the staircase to the upper floor, which is approached from the outside only. The openings for light and ventilation to the staircase are not filled in with sashes or frames, but are left clear. On both floors a space is arranged off the staircase for dust-bin and soiled linen bin. There is also on each floor a nurses' water-closet quite isolated from the ward block. The water-closets, sinks, and bath-rooms for the wards are placed in projecting wings at the ends of the blocks, and are cut off from the wards by cross-ventilated lobbies. The isolation block is a one-storey building adapted from the model plan issued by the Local Government Board. It contains two nurses' duty-rooms entered from verandahs, placed one on either side of the block. One duty-room has a ward for two beds, and one for a single bed attached to it, and the other has only a ward for two beds. To each set is provided a water-closet and sink, and a space for a wheel bath. The laundry is a one-storey building, and contains a general laundry for patients' clothes, and a separate laundry for officers. The disinfection block contains a room for the reception of infected clothes, in which is a Lyon's high-pressure steam apparatus and a room for clothes after disinfection, into which one door of the apparatus opens; there is also a small clothes store. Adjoining the last-mentioned room are the mortuary and the post-mortem room, and beyond are the ambulance-house, stable, and harness-room. On the whole, this hospital may fairly be regarded as one of the best-arranged infectious hospitals yet erected. The details have been very carefully thought out, and, considering the restricted area of the site, the arrangements are most satisfactory.

Nottingham Borough Epidemic Hospital.—This hospital is to a large extent modelled on that at Newcastle. The site is about twelve acres in extent, and accommodation is provided for eighty-two patients, space being left for future extension. The buildings are eight in number. At the entrance is a detached porter's lodge. The administration block, to which is attached a separate laundry for officials, is partly three storeys and partly one storey in height, and contains the quarters for resident officers, kitchen, offices, &c. The ward blocks are four in number, and are connected with each other and with the administration block by closed-in corridors. Two of the ward blocks are called "fever blocks," and contain each two wards of ten beds each, two small single-bed wards arranged as at Newcastle and entered from the large wards, ward kitchen, and cupboards for food and linen. Each large ward has a bath-room and water-closets placed in projecting wings, with properly arranged lobbies of access, and a bath-room is also provided at the entrance to each ward block, presumably for use on discharging patients. One ward block is called an isolation block, but is merely a series of rooms all connected by a closed-in corridor, and certainly not suitably arranged for the treatment of more than one kind of disease. The fourth block is intended for small-pox, and is planned in the same way as the fever-ward blocks. It has in addition a small block containing both day and night accommodation for nurses. The other two buildings are entirely detached, and contain respectively the laundry and disinfecting apparatus, and the stable, ambulance-house, and mortuary.

Port Sanitary Authority, London.—For cases of infectious fevers arising within the jurisdiction of the medical officer for the Port of London, a small hospital has been provided at Gravesend. It stands on a square plot of ground, fronting the main road, with a narrow slip running down to the river at the north. The buildings are four in number, and, going from south to north, stand in the following order, one behind the other: (1) laundry, disinfecting-room, mortuary, dry-earth store, and ambulance-house—a one-storey building; (2) ward block, containing two wards, one for six, the other for four beds, with bath-room, attendant's room, and earth-closet and lavatory to each ward, placed in projecting wings, and provided with cross-ventilated lobbies; (3) block containing two one-bed wards, with earth-closet and lavatory; and (4) an administration block, containing dispensary, living-rooms, kitchen and scullery, and bedrooms on upper floor. This block is the only one

having an upper storey. The closets are on the dry-earth system ; the slop-water is taken to a disinfecting-tank, and thence discharged into the river.

River Tyne Port Sanitary Authority.—The Port Sanitary Authority of the River Tyne is one of the few port sanitary authorities which have provided efficient isolation accommodation in the actual waterway of the port over which their jurisdiction extends. The hospital is built upon ten cylindrical iron pontoons with hemispherical ends. Each pontoon is 70 ft. long and 6 ft. in diameter, and the floating power of the entire structure is equal to 535 tons. Upon the pontoons a strong framework of iron is placed, which carries a deck of creosoted timber. The wards and other buildings are erected upon this deck. The three main buildings, which are shown upon the plan, each consist of two wards, one for six beds, the other for four beds, with a nurses' room and bath-room dividing them. To each ward a small scullery and a water-closet are provided. A gangway runs round at the ends and sides of each building, where it abuts on the river. At the back of the central ward is a small mortuary, which appears perilously near the ward windows, the clear distance being only three feet. A second floating hospital, formerly used for cholera, is now used as the administration block for the Pontoon Hospital, to which it is connected by a gangway.

The Sanitary Hospital at Bournemouth consists at present of three blocks of buildings erected in 1886. An administration block, comprising residence for matron and two or three nurses, room for medical officers, and kitchen offices. The ward block consists of two sections, one being a copy of the other, and the two being separated by a central division wall. At the end is a ward for three beds, adjoining which is a nurse's room, and a ward for two beds ; the above arrangement in reverse order is then repeated. All these rooms open on one side on to a verandah, on the other on to an open corridor, off which the recess for portable bath and the water-closets are arranged. This block is copied from the unfinished isolation block at the London Fever Hospital. The third block contains the washhouse, mortuary, ambulance-shed, and disinfecting apparatus. The arrangements of this hospital are noteworthy as being one of the earliest examples of the carrying into practical effect the views of the Local Government Board on the planning of isolation hospitals. The buildings are all placed inside a belt 40 ft. in width from the boundary of the

site. The administration block is placed close to the entrance, in order that persons whose business brings them to the hospital need not of necessity approach the ward block. Finally, the ward block is arranged specially with a view to isolating rather than to treating. The site contains rather over five acres, and there is ample space for future extension.

The Sheffield Borough Hospital for Infectious Diseases stands on a site of rather over an acre and a third, and was erected by the Corporation in 1880–81. Detailed plans are published in Dr. Thorne's report (*op. cit.*) from which the following description is also drawn. The plans were designed by Mr. S. L. Swann, of Sheffield, who obtained the appointment in a competition, on the recommendation of Captain Sir Douglas Galton. The buildings are eight in number, viz. administration block, laundry, mortuary, and ambulance block, four ward pavilions, and two entrance lodges. The main entrance is on the south-west, while the administration block is at the north-east end of the site; thus, persons having business at the latter must traverse nearly the whole length of the site and pass between the four ward pavilions to arrive at their destination. The administration block comprises the usual offices and residences for the staff. Each ward pavilion is two storeys in height, and contains on each floor a ward for eight beds, with a convalescent-room and nurses' room at one end, and bath-room and water-closets at the other. The latter are built out at an angle of 45° to the axis of the ward, and the end of the ward is semi-octagonal in form. There are five windows on each side of the ward, there being in each case a small window between the end bed and the wall. The floors are of pine, waxed polished, and the walls are painted; all the rest of the woodwork is of oak. The wards are warmed by two open fireplaces, fixed back to back in the centre, provided with a supply of fresh air from the outside. All the ward pavilions have flat roofs, which serve as recreation grounds for convalescent patients—a valuable provision, as tending greatly to lessen the chances of infection between patients convalescing from different diseases.

Sittingbourne and Milton Joint Infectious Hospital.—This hospital is intended for the use of the seventeen parishes comprised in the Sittingbourne Union, and is under the direction of a joint hospital board. The buildings are four in number: the administration block, two ward blocks, and a detached building containing the disinfecting chamber, washhouse, mortuary, and ambulance-

house. The administration block contains the matron's and surgeon's rooms, kitchen offices, and bedrooms for nurses and servants. This block is placed midway between the two ward blocks, with each of which it is connected by covered ways open at the sides. The ward blocks are one storey in height, and each contains two wards for four beds each and two for two beds each, with a ward scullery and bath-room in the centre, and a water-closet and slop sink to serve for each pair of wards (a large and small one). The whole block communicates from end to end, and all the wards must be nursed and administered from the central ward scullery. The object, therefore, of the subdivision into small wards is not plain, as it seems obvious that only one class of disease could safely be treated in each block. The position of the administration block is essentially wrong, inasmuch as all tradesmen and visitors to the hospital must come into close proximity to the wards.

Temporary Small-pox Hospital, Liverpool.—As an example of the rapid provision of hospital accommodation to meet a sudden emergency, the temporary hospital erected by the Corporation of Liverpool in 1884 in view of the threatened invasion of small-pox is very interesting. The site consists of twenty acres on the banks of the Mersey, and had, when taken to by the Corporation, a large house standing on it, which with its out-offices was utilised as the administration offices, laundry, ambulance shed, &c. The hospital proper consists of four pairs of double hospital tents and two pairs of iron buildings. Each pair of tents is connected together by a building containing nurses' day-rooms, bath-rooms, and earth-closets; similar buildings connect the iron huts. The kitchen scullery, airing-room, and dry-earth store are built of brick; the larder and store-room are of timber framing covered with Willesden paper, as also are the connecting blocks between the wards. The mortuary and post-mortem rooms are in a detached building of timber framing covered internally and externally with Willesden paper. The hospital proper occupies a site 460 ft. by 220 ft., on which two terraces, each 40 ft. wide, were formed; on these terraces a bed of concrete 6 in. thick was laid for the tents. The whole hospital was erected and ready for occupation within two months.

British Hospitals for Infectious Diseases.

Name.	No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
London Fever Hospital ..	169	8'50	122'35	16'00	1,957'60	—	804'14
Metropolitan Asylums Board							
Eastern	472	—	—	—	—	—	731'55
South-Eastern	462	—	—	—	—	—	895'71
South-Western	340	—	—	—	—	—	1,024'94
Western	224	—	—	—	—	—	1,232'59
North-Western	443	—	—	—	—	—	1,081'62
Gateshead	32	12'00	144'00	16'00	2,304'00	—	—
De'ancey Hospital, Cheltenham ..	32	—	*144'00	—	*2,300'00	—	—
Netherfield	101	—	—	—	—	—	—
Monsall Hospital, Manchester ..	—	—	—	—	—	—	—
Oldham	—	—	168'75	—	2,025'00	—	—
Newcastle-on-Tyne City Hospital	94	10'00	152'10	—	1,505'00	—	—
Bradford	68	—	151'87	—	—	—	5,124'70
Huddersfield	—	—	—	—	—	—	—
Leeds	80	—	—	—	—	—	—
Sheffield	64	—	138'00	13'18	1,810'00	—	—
Bolton	28	—	144'00	—	2,080'00	—	6,142'50
Liverpool Temporary Hospital ..	—	—	—	—	—	—	—
Liverpool City Hospital (South) ..	69	12'00	156'00	—	—	—	1,293'52
Bournemouth	10	—	—	—	—	—	—
Caermarthen Joint Counties Asylum	20	—	—	—	—	—	—
Glasgow, Belvidere Hospital ..	34	—	—	—	—	—	—
Hull	—	—	—	—	—	—	—
London Port Sanitary Hospital ..	10	—	—	—	—	—	—
Sittingbourne and Milton Joint Hospital	24	—	—	—	—	—	—
Heathcote Hospital, Leamington	22	12'00	{ 216'00 156'00 }	—	{ 2,592'00 2,028'00 }	—	—
Hornsey	10	—	—	—	—	—	—
River Tyne Port Hospital ..	30	—	—	—	—	—	—
Barnsley, Kendray Hospital ..	—	—	—	—	—	—	—
Nottingham Boro	82	—	150'00	—	—	—	—
Ladywell Sanatorium, Salford ..	232	—	—	—	—	—	1,334'00

* Average.

(c) Foreign Infectious Hospitals.

Blegdams Hospital, Copenhagen.—For the treatment of infectious diseases, in the commune of Copenhagen, two hospitals have been established by the municipality: the Blegdams Hospital with some 300 beds, and the Oresunds Hospital with 74. Of the former, as being the more important, and also as an excellent example of modern hospital planning, we give a plan. The Blegdams Hospital occupies a site of an irregular four-sided form of about 19 acres, which formerly belonged to the communal pastureland of Blegdams. On two sides its boundaries are formed by public roads, on one by a churchyard, and on the other by large open fields—the communal land referred to. The buildings are all detached, and comprise the following:

(1) *Front Administration Block.*—The centre portion of this

building is one storey high, and contains six rooms for porters, and two bath-rooms for the visiting medical staff. Each bath-room has on each side a dressing-room, one communicating with the entrance hall, the other with a lobby leading out to the wards. The medical officer on arriving leaves his ordinary clothes in the first dressing-room, and passing through the bath-room assumes his hospital garments. On returning he reverses the process, and in addition, takes a bath before putting on his ordinary clothes. The wing to the left of the entrance contains the rooms for the reception of patients with bath-rooms attached, also a large store-room. In the wing to the right are the directors' offices, and two rooms for visits to convalescent patients. The wall of separation between these two rooms is furnished with a window and a grille. The patient is in one room and his visitor in the other, and they can see and converse, but cannot touch one another. The access to the patient's room is quite separate and distinct from that to the visitor's room. On the upper floor of one wing are the rooms for the inspector and the resident medical officers; and on that of the other wing are the rooms for the matron, the linenry and workrooms. In rooms formed in the roof is a store for the patients' clothes.

(2) *The Kitchen Offices.*—In the centre is the large kitchen, having on one side a dining-room for staff and rooms for the servants, and on the other a small kitchen for use when the number of patients is low, and sculleries. The larders are in the basement.

(3) *The Laundry.*—Consists of a large and a small washhouse, the latter for use when the number of patients is low. There is also a drying-closet fitted with horses, and this again is divided into two unequal divisions for the same purpose. The above, together with three sorting-rooms and two rooms for the women employed in the washhouse, occupy the ground floor. In the basement are the furnaces and boilers for supplying hot water and steam for the washhouse, and the *calorifère* for heating the drying-closet. Here are also rooms for ironing and calendering, the disinfecting apparatus, and fuel store. The apparatus itself is an iron chamber heated by gas, and has two doors each opening into a different room, the only communication between the two being through the disinfecting oven. An electric apparatus reduces the supply of gas when the required temperature is reached.

(4) *The Ward Pavilions* are eight in number—two of these contain only wards of one bed each—one of which, the observation

pavilion, is intended for cases requiring isolation, the other for patients who wish to be private. The six other pavilions are each divided into two equal parts entirely distinct one from the other. The plan of these pavilions varies somewhat. In five, each side contains a large ward for twelve beds, an isolation ward, bath-room, scullery and nurse's room. In the sixth, the large ward is subdivided into two smaller wards of six beds each. The water-closets are approached directly from the ward without any intervening ventilating lobby. The ventilation and warming was designed by M. H. V. S. Gredsted, inspector of the Copenhagen Municipal Hospitals. "Fresh air is conducted from wells at a proper distance from the building, to an air chamber in its cellar, from which it is conducted under the floor of the sick-ward, into which it ascends through three openings in the floor. In the cellar a fire is kept up all the year round; during the cold season, the draught from the furnace is conducted to a chimney in the centre of the building through a *calorifère* placed in the chamber; hereby the fresh air gets a suitable temperature, while the draught in summer is conducted directly to the chimney without passing the *calorifère*. The chimney will thus always be able to exhaust the vitiated air of the sick-ward, which is effected by means of channels, leading to the chimney from openings in the walls of the ward at various heights from the floor. The draught in the fireplace, in which the consumption of fuel naturally varies according to outside temperature, can be regulated with a simple mechanism from the cellar as well as from the sick-ward, so that it goes partly through the *calorifère*, partly directly to the chimney, and that an increase of one passage corresponds to a diminishing of the other; in the same manner the exhaust can be regulated; its strength can be read from an anemometer in the ward; it may be regulated or entirely stopped according to circumstances."*

(5) *The Mortuary* contains a large dead-house, a mortuary chapel with separate entrance and waiting-room, a post-mortem room, and a doctor's room.

(6) *The Stable Building* contains stalls for four horses, double coach-house, store for beds, and store for tents.

(7) Adjoining four of the ward pavilions are small detached buildings in which are rooms for nurses.

The buildings are throughout built of brick in a permanent

* *Denmark: its Medical Organisation, Hygiene, and Demography.* Copenhagen, 1891.

fashion, and the roofs are slated. The total accommodation has been given at 300 beds ; in this number are included some movable tents (Droecker's patent) which are kept ready for erection in time of emergency, and provide for about fifty beds.

Ullevold's Hospital. Christiania Communal Epidemic Hospital, Sweden.—This hospital is built upon the isolated pavilion plan, and consists of fourteen distinct buildings, all of which, with one exception (the mortuary), are arranged in four parallel lines. In the first line, on the boundary of the site, is the administration building with a stable building on each side. In the second line are two observation pavilions and two ordinary sick pavilions. In the third line, in the centre, is the steward's department with a sick pavilion on either side, and in the fourth line are three sick pavilions. The mortuary occupies the corner of the site most remote from all other buildings. The sick pavilions each contain two pairs of wards for six beds each. The central part of the pavilion contains two ward kitchens, two linen cupboards, a store-room, two entrances to the wards, and a third entrance to the central staircase which leads to four rooms above for the staff. The two pantries communicate, but it would appear from the plan that the two sets of wards are intended to be worked separately. Between each pair of wards is a lobby leading to a common bath-room, and two other lobbies separated by a wall leading each to a water-closet. At the further end of the outermost wards are two single-bed wards and a lobby leading thereto and to an open balcony. The observation pavilions are also planned in duplicate, and contain each four wards for one bed each, and four rooms for staff. Each ward is entered from the outside and has its own closet, and each ward communicates with a nurse's room. The two nurse's rooms on each side of the party wall communicate with each other. The "steward's building" contains the washhouse and laundry, disinfecting-house, bath-house, stores, dairy and kitchen offices.

Foreign Hospitals for Infectious Diseases.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
Co enhagen, Blegdams Hospital ..	300	ft. —	ft. 86'06	ft. —	ft. —	ft. —	ft. —
Oresunds Hospital	74	—	—	—	—	—	—
Christiania, Ullevold's Hospital ..	204	—	—	—	—	—	—

(5). HOSPITALS FOR INCURABLES, CANCER, AND PARALYSIS.

British Home for Incurables, Clapham Road.—The present home of this institution consists of a row of private dwelling-houses altered and added to. A new home is in course of erection at Streatham. The designs for the new building, which are of a somewhat ambitious nature, have been prepared by Mr. Arthur Causton, and include a chapel, entertainment hall, and winter-garden, besides accommodation for fifty patients. The plans, so far as they have been matured, appear to be modelled more on the lines of a convalescent home than on those of a home for incurable or chronic patients. They are, however, simple, and with a little attention to points of detail will no doubt work out well. It is, of course, premature at the present stage to criticise the arrangements too minutely.

Cancer Hospital, Brompton.—The oldest part of this hospital was erected in 1851, and consisted of a simple oblong block. In order to economise space, as it was thought, the building was not made rectangular, but the end and cross walls were made to run parallel with the then boundaries of the site to the east and west, while the front and back walls were set parallel to the roadway. The effect of this unfortunate arrangement will be seen in the plan, where some of the walls of the central portion, notably the medical officers' rooms and the "occasional ward" above, are out of square with the rest. The two wings were added in 1882-83. The basement floor contains the out-patient department and the kitchen offices. The ground floor contains the administration offices and residences for officers in the central portion, and two wards, one in each wing, with nurse's room, bath-room, and lavatory attached. The ward water-closets are in the octagonal towers flanking the ends of the wards. The first floor contains in the central portion, wards, nurses' rooms, linen-room, operation room, assistant medical officer's room, and a ward scullery, and in the wings two wards similar to those below.

Home for Incurables, near Belfast.—This hospital was erected in 1883-4 as a memorial to Dr. William Thompson. It is situated on rising ground overlooking the town of Lisburn, county Antrim, and commands a fine view of the surrounding country. The building consists of a long straight block with slightly projecting wings at each end in the front, and with three wings projecting at the back. At the back of the main or front block a corridor runs from

end to end with the rooms arranged on one side only. This corridor is divided by glazed screens and doors into three parts, the central portion being chiefly administrative, the right-hand portion being devoted to female patients, and the left-hand to male patients. The central portion on the ground floor contains the matron's rooms, committee-room, and nurses' dining-room, main staircase, linen-room, store, servants' hall, and medicine store, and the kitchen offices in the central wing. On the male side is a large day-room, a dining-room, and a smoking-room, and on the female side a similar day-room and dining-room and a spare room. The two wings at the back contain ward scullery, bath-room, lavatory, housemaid's closet and water-closets, and each wing is separated from the corridor by a cross-ventilated lobby. The first floor contains in the centre a nurse's room with two wards on each side, and, at the back, four nurses' bedrooms, the main staircase, and a detached cancer ward with lavatory and bath-room, and small ward for one bed. The male and female sides contain each a large ward for eight beds, and two smaller wards for four and five beds respectively. The nurses' and servants' bedrooms are in the floor above.

Longmore Hospital for Incurables, Edinburgh.—This is a building of the T form with a somewhat ornate exterior. The central block is slightly wider than the wings, and is divided in the centre transversely by a wall, which separates the female from the male patients. On each side of the wall at the back is a staircase, and there is a door of communication between the two sides of the corridor. The wings are wards for ten beds each, and are two storeys in height. The central portion contains, on the ground floor, the entrance hall, waiting-room, matron's rooms, with bath-room and water-closets, two rooms for paying patients, nurses' duty-rooms, lavatories, and water-closets, there being no disconnection between the latter and the wards. The first floor contains the same arrangements of nurses' rooms, and lavatories, &c., two large day-rooms, one for each sex, and two rooms for paying patients. The upper floor contains bedrooms for nurses and servants, and a large clothes-store. The wing at the back is partly two storeys, partly one storey. The two-storey portion contains the kitchen and nurses' dining-room on the ground floor, and two special wards, a surgeon's room, and two water-closets above. The one-storey portion contains the remainder of the kitchen offices and the laundry.

Midland Counties Home for Incurables, Leamington.—

Established in a private dwelling-house by a medical man, and since carried on by a committee, this institution calls for no further description.

National Hospital for the Paralysed and Epileptic, Queen Square, London.—From the appearance of this building, both as regards its exterior and its interior, no one would suppose that there is much difficulty in procuring funds for the erection of hospitals in London. The exterior is handsome and effective; the buildings are faced with red brick, with terra-cotta cornices and dressings, and present a most picturesque appearance peculiarly well adapted for its position in the quiet old square, full of houses of the earlier part of the last century. The hospital consists of two separate blocks, the one facing Queen Square and the other having part of its frontage towards Powis Place at the back. The front building is planned on the single pavilion type, having a central block containing the administration offices and two ward wings. The back building is formed of a central block and two ward wings, but the wing to the south is not in line with that to the north, being placed much further back. In the front block there are at the ends of the wards two projecting blocks, one being bath-rooms, the other single-bed wards, and the recess thus formed contains on each floor a balcony with access from the wards. In the basement is a set of medical baths planned on the lines of those at University College Hospital.

Northern Counties Hospital for Incurables, Mauldeth, near Manchester.—The objects of this charity are: first, to provide medical advice, &c. for those persons who, suffering from some chronic or incurable disease, are able to maintain themselves, but are not eligible to the ordinary medical charities; and secondly, to provide a home for life for those persons of both sexes who, having led respectable and honourable lives, have been attacked by disease, and who, by its long continuance, have exhausted their means, or have lost the friends who would have cared for them. The building in which the work of the hospital is carried on, Mauldeth Hall, is a large house, formerly the residence of the Bishop of Manchester, to which additions were made when it was given over to its present use. The house stands in grounds of about forty acres, and is in every respect more of the nature of a home than a hospital.

The Royal Hospital for Incurables, Putney.—This large institution consists of two blocks of buildings placed at right angles

to each other in the form of an L. The entrance is in the centre of the lower or horizontal stroke, and the buildings are so placed that two of the sides face almost due south and west. The wards are, in every case but one, corridor wards; those in the old part (the entrance block) being placed on both sides of the corridor, those in the new wing having a corridor on one side only. The water-closets are in no cases separated from the wards or corridors by ventilated lobbies. A special feature of note in the new wing is the large assembly room for concerts and entertainments, and other social gatherings for patients of both sexes. No information can be given as to the number of beds, as the committee have expressly declined to "submit the details of the internal arrangements of the hospital with a view to publication." It is with great regret that we have to record this, the only refusal of the kind out of many hundred similar applications.

British Hospitals for Incurables, Cancer, and Paralysis.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Cancer Hospital, Brompton, London ..	110	8'50	110'00	14'00	1,540'00	27'92	—
Incurables, Royal, Putney, London ..	—	—	—	—	—	—	—
British Home for Incurables, London ..	—	—	—	—	—	—	—
Northern Counties, near Manchester ..	—	—	—	—	—	—	—
Midland Counties, Leamington ..	—	—	—	—	—	—	—
Longmore Hospital, Edinburgh ..	46	7'33	68'00	13'83	940'44	28'36	641'73
Belfast	62	6'00	124'80	14'00	1,747'20	13'30	6,323'22
Paralysis	—	—	—	—	—	—	—
National Hospital, Queen Square, London	—	—	—	—	—	—	—
Incurables, Aberdeen	81	—	93'50	14'00	1,309'00	21'16	1,247'00

Special Hospital for Cancer.—United States.

Cancer Hospital, New York.—This hospital was erected in 1884, and, as appears from the report of the managers, is a part only of the projected work undertaken, inasmuch as the building affords accommodation for female patients only, a hospital for men being left for future erection. The building was erected at the sole cost of Mr. John J. Astor. The site is limited in area, but being at the corner of two wide streets is well open on two sides. In plan the hospital consists of one straight block with circular towers on each of three angles. The ground floor is partly occupied by the administration offices; there are also in one of the circular towers four private wards with a common dining-room attached. On the

first and second floors two of the circular towers are general wards for eleven beds each, the third being divided into four private wards and a common sitting-room. The circular wards are so joined on to the main building that fully one-fourth of the circumference is lost for purposes of light and ventilation, and, as there are only five windows to the eleven beds, the lighting does not appear to be altogether adequate. Although this is certainly not an example of circular wards under the most favourable conditions, yet it is obvious from a study of the plan that the adoption of the circular form gives better results than could have been obtained with rectangular wards. The kitchen offices, operation room, and resident officers' quarters are placed on the top floor. The servants' quarters are in a detached building.

	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
UNITED STATES. New York Cancer Hospital	71	10'85	103'10	—	—	—	—

(6). LYING-IN HOSPITALS.

British Lying-in Hospital, Endell Street, St. Giles, London.—

This hospital was first instituted in 1749 in Brownlow Street, Long Acre. It was rebuilt in 1849 on the present site. The charity is exclusively for poor married women, and no patient is admitted unless she either makes an affidavit of marriage, or produces her marriage certificate. Out-patients are attended at their own homes if within reasonable distance, and a certain number of patients are admitted to private rooms on payment of a fee of £2 2s. per week. This part of the work is entirely separate from the hospital, and is self-supporting. It is intended for the wives of "young clerks, shopmen, &c. who live in lodgings where they cannot be confined with comfort, or who cannot afford the cost of superior nursing and medical attendance."* The building occupies a corner site in Endell Street, and is a square block partly five storeys and partly four storeys high.

City of London Lying-in Hospital, City Road, E.C.—This hospital was established at London House, Aldersgate Street, on the 30th March, 1750. It was removed in 1751 to Shaftesbury

* *Report for 1887.*

House in the same street, and in 1773 the new buildings on the present site were opened for the reception of patients. Married women only are eligible for admission as in-patients, and each patient is required on admission to produce her marriage certificate. The site is at the corner of Old Street and City Road, and is fairly open on all sides. The main building is in the H form, the sides forming the general wards, and the central part containing administration offices and the labour and isolation rooms. The lavatory blocks at the sides of the ward blocks were erected in 1878, and the detached kitchen offices were added in 1882. The reception-room for pregnant women is in the one-storey block to the north-east of the main block. Here patients are received, examined, and dressed in the hospital clothes; their own clothes are removed, placed in the disinfecting apparatus, and put away in the store-room until the patients again resume them on their discharge.

General Lying-in Hospital, York Road, London, S.E.—This hospital is stated in Highmore's "Charities of London," to have been instituted in the year 1765 "as an asylum for the wives of poor industrious tradesmen or distressed housekeepers, who either by unavoidable misfortunes, or the burthen of large families, might be reduced to want, and rendered incapable of bearing the expenses incident to the pregnant and lying-in state; also for the wives of indigent soldiers and sailors, the former particularly being very numerous in and about the City of Westminster." The scope of the charity was subsequently enlarged to include single women who are found, upon careful investigation, to have shown good conduct and to be objects of real commiseration. There is also a training school for midwives and midwifery nurses to work among the poor. The original name of the hospital, under which it appears in the work just referred to, was the Westminster Lying-in Hospital, and its name was changed when the charity was removed to the present building in 1830. The building is a small one, and the site upon which it stands is very restricted. The plan is of an irregular type, and the whole building appears to be in intimate atmospheric inter-communication. This hospital, in common with all other lying-in hospitals in London, has had its periods of disaster, but it would appear that of late years the conditions have shown a marked improvement.

Glasgow Maternity Hospital.—The plan of this hospital somewhat resembles that at Edinburgh in the L-shape (see page 296). It was erected in 1880. The ground floor contains the entrance,

board-room, reception-room, kitchen and scullery, matron's rooms, and doctor's rooms. The first and second floors contain each five wards, one for seven beds, one for five, and three for two beds. The water-closets, bath-rooms, and lavatories are placed in a projecting building, with cross-ventilated lobby of access from the corridor. The upper floor contains isolation wards and bedrooms for nurses and servants. In a separate one-storey building are laundry, wash-house, disinfecting-chamber, &c. The wards are warmed and ventilated, partly by open fireplaces and windows, and partly by an artificial system of low-pressure hot-water pipes, with provision for the admission of fresh air, and extraction flues connected to the flue from the boiler of the heating apparatus.

Ladies' Charity and Lying-in Hospital, Brownlow Hill, Liverpool.—This hospital consists of three distinct buildings, a central administrative block, with two patients' blocks, one on either side, the latter being connected with the administrative block by covered ways or bridges. The central block contains on the ground floor the matron's sitting-room, mess-room for staff, board-room, and pantry, a reception-room and bath-room, with separate entrance for patients, a detached water-closet, and a room entered only from the outside containing troughs for disinfecting linen. On the upper floor is the matron's bedroom, linen-rooms, bath-room, and servant's bedroom. The lifts for food and coals are in this block. Each patients' block contains three wards for one bed each, a nurse's bedroom—so placed that by means of inspection windows and glass panels in doors she can see into each ward without getting out of bed—a scullery, and a water-closet. The only fault in this otherwise excellent plan is the imperfect disconnection of the water-closet. It is certainly provided with a lobby, but the lobby is ventilated on one side only. Again, it is true that the water-closet is not entered directly from the wards, but from a well-ventilated passage; but in spite of all this, mischief might happen, and where so much care has been bestowed on the plan to ensure the most complete isolation to each patient, it is a pity to have omitted any single precaution against possible harm.

Mothers' Lying-in Home, Shadwell, London.—This little hospital, consisting of a small house in Glamis Road, close to the East London Hospital for Children, was opened in December 1884. It owes its origin to the exertions of Lady Greville. The accommodation is only for six patients, but it is hoped that the institution may be greatly extended in the future. Each mother has a room

to herself, and the home is intended especially for the reception of poor married women, without distinction of race or creed. The charity also provides for the attendance upon poor women at their own homes by properly qualified midwives.

Queen Charlotte's Hospital, London.—In 1752 the Bayswater Lying-in Hospital was established. The exact site is not known for certain, but it probably was in St. George's Row, near Oxford Street Turnpike. Its name was altered to the "General Lying-in Hospital at Bayswater," subsequently to the "Queen's Lying-in Hospital," and finally to that which it at present bears. The institution was removed in 1813 to an old house called "Lisson Green Manor House," in which the work was carried on until 1855, when the old house, having become dilapidated and unfit for its purpose, was demolished, and a new building, the nucleus of the present hospital, was erected in its place. In-patients eligible for admission are defined to be married women, single women with their first child, and widows giving birth to posthumous children, irrespective of religion and nationality. The building consists of a square block five storeys in height, with a projecting wing of two storeys. The basement floor contains the kitchen offices, nurses' dining-hall, servants' dining-hall, housekeeper's room and stores, three isolation wards, and, in two detached buildings, (1) room for medical students with water-closet and separate entrance from the area, scullery and water-closet for the isolation wards, and tank-room for purifying ward linen, and (2) linen-room, disinfecting chamber and messenger's room. The ground floor contains the matron's and medical officer's rooms, board-room, secretary's office, and out-patients' waiting-room, with lavatories, &c., attached; four convalescent wards with ward-scutlery and water-closets, and a small chapel and ladies' waiting-room. The first and second floors are entirely occupied by wards, with a nursery in the centre. Two wards on each floor are labour wards, and contain one bed each. The other wards have three and four beds each. The top floor contains the dormitories for nurses and servants.

Rotunda Hospital, Dublin.—In the year 1745 Dr. Bartholomew Mosse at his own cost opened a hospital in George's Lane, Dublin, for the reception and relief of poor and distressed lying-in women, and furnished it with twenty-eight beds. The hospital so started was the first of its kind to be established in the United Kingdom, and was the parent of the well-known Rotunda Hospital. Finding the house in George Street too small for the relief of the numbers

applying for admission, Dr. Mosse some few years subsequently took a lease of a piece of ground in Great Britain Street, some four acres in extent, part of which he laid out as a garden for the entertainment of the public, while on the front part he built a new hospital for 150 beds. The garden was laid out, planted and supplied with a coffee-room and orchestra, to the intent that the profits arising from its use as a place of public entertainment should become a source of income to the hospital. Upon the purchase of this ground and the erection of the buildings, &c., the benevolent founder exhausted all his private fortune, and within two years of the foundation stone being laid he died in great poverty at the early age of forty-seven. In 1764, in response to a petition, the Irish Parliament granted a sum of £1,000 to the governors for the purpose of building a large room in the hospital gardens "for the better accommodation of the company that resort to said gardens, and for musical entertainment."* The money thus granted was expended in building the circular concert-room or Rotunda, from which the hospital takes its name, to which some twenty years later ball-rooms, concert-rooms, and exhibition-rooms were added.

At the present time the hospital consists of a rectangular block of three storeys, having its main façade facing south ; on the east side is the Rotunda with its subsidiary buildings, and on the west is a small building used as a residence for male officers and pupils. Both this building and the Rotunda are connected with the main block by open colonnades. The hospital building is, as we have said, a rectangular block ; a corridor runs from east to west on each floor, out of which the wards and other rooms open. More than a third of the ground floor is taken up by the rooms of the master, who also has two rooms on the first floor. From the plans published in the work referred to above, it would appear that there are no sanitary offices of any kind either on the ground floor or first floor. The wards vary in size, the smallest being 18 ft. 4 in. by 13 ft. 10 in., and the largest 23 ft. 9 in. by 16 ft. 10 in. In the latter the windows are in the smaller side or end only. Plans have been prepared for a new wing to be built on the west side of the old building, which will provide on the ground floor a large waiting-room, two rooms for the assistant doctor, a day-room, five small wards and two dormitories for servants, together with two blocks of sanitary offices and a corridor connecting the new wing with the old hospital and with

* *Concise History of the Rotunda Lying-in Hospital, Dublin*, by S. F. Adair. Dublin, Browne & Nolan, 1892.

the resident (male) officer's quarters. On the first floor will be two large wards, each 65 ft. by 25 ft., two small wards, a ward kitchen, ante-room and theatre; and above will be dormitories for nurses.

The Royal Maternity and Simpson Memorial Hospital, Edinburgh.—It would appear from the plans that this building is not yet complete. The present building is L-shaped, but a future wing is projected, placed at right angles to the end of the horizontal stroke of the letter. There are four floors, consisting of basement, ground and first floors, and attics. The basement contains the kitchen offices, dining-hall, four bedrooms, and laundry. The ground floor contains the main entrance, dispensary, matron's room, resident medical officer's sitting-room, labour-room, and two wards, one large and one small, with nurse's room, ward scullery, and water-closets at the end of the large ward. The only access to the water-closets is through the scullery, but there is a proper disconnecting lobby. The first floor contains similar wards and labour-room, with committee-room, two bedrooms for medical officers, and one for matron.

British Lying-in Hospitals.

—	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
General, York Road, London	24	—	172'66	12'50	2,158'25	47'33	405'00
City of London, London	33	—	98'40	13'00	1,279'20	42'18	990'00
Queen Charlotte, London	74	—	97'33	13'50	1,313'95	33'75	—
Shadwell, London	6	—	—	—	—	—	—
Brownlow Hill, Liverpool	12	—	—	—	—	—	—
Edinburgh	28	—	172'80	14'50	2,505'60	49'80	452'89
Glasgow	34	—	99'75	13'00	1,296'95	30'93	204'70
Endell Street, London	—	—	—	—	—	—	—
Dublin, Rotunda Hospital	—	—	—	—	—	—	—

(7). CONVALESCENT HOSPITALS.

All Saints' Convalescent Hospital, Eastbourne.—This large institution consists of two long parallel blocks of buildings joined together in the centre by a connecting building. The front block is symmetrical in form, has a projecting wing in the centre, and is three storeys in height; the block at the back is one storey only. The central projecting building contains the quarters of the community of sisters who work the hospital. In each angle formed by the junction between the central projection and the wings of the main building are placed the entrances; that to the east being for women, that to the west for men. The exact centre of the main

building is occupied by a wall which divides the men's side from the women's ; and on each side of this wall is a large vestibule, in which the main staircase is placed. Taking first the women's side, and proceeding eastward, the following rooms are found—two sitting-rooms for patients ; four rooms for sisters and nurses ; ward for ten women. Lavatories and water-closets are placed in two projecting wings at either side of the ward, and adjoining the water-closet block is a one-storey building containing a sitting-room for women, entered only from the outside. The west wing contains similar accommodation for men, except that the outside sitting-room is larger and is of two storeys, with a circular staircase leading to the upper floor. The upper floor of the main front building contains, on each side, two large wards for twelve beds each, with sisters' and nurses' rooms ; and an additional ward on the men's side, over the outside sitting-room, for ten beds. The back building contains the kitchen offices and stores, dining-halls for women and for men and boys, refectory for sisters, day-room for boys, and the chapel.

Atkinson Morley Convalescent Hospital, Wimbledon.—

This institution belongs to St. George's Hospital, and was established by Mr. Atkinson Morley for the sole benefit of patients of that hospital. The plan belongs to the single pavilion type, with the addition of a deep projecting wing in the centre, which makes the building take the form of a T. The basement floor contains the kitchen offices and cellars in the front wing, and day-rooms and dining-rooms (one for each sex) in the side wings. On the ground floor the centre of the projecting wing contains the entrance hall, superintendent's dining-room, board-room, dispensary, vestry, and chapel, and, midway between the two side wings, the general store-rooms. The side wings contain two wards in each, one for five beds, and one for twenty, with nurses' rooms, bath-rooms, lavatories, water-closets, &c. On the upper floor the front portion of the front wing contains the superintendent's rooms ; beyond these is the upper part of the chapel with its gallery and corridors leading thereto. The central portion over the store-rooms is devoted to linen. On either side are four single rooms, one set for men, the other for women, and beyond these are two large general wards for twenty beds each, with the lavatories and other offices similar to those below.

Barnes Hospital, Cheadle.—The plan of this large institution consists of a long building with a wing projecting in the centre of the front, a large block projecting in the centre at the back, and

wings at each end projecting slightly in the front and considerably more at the back. The central projection in front is the medical superintendent's residence and the board-room. The large building at the back referred to contains a winter garden, on one side of which is the general dining-room and the chapel, on the other the kitchen offices. The main building contains the wards and day-rooms. The only plans of this hospital available are so very imperfect that a more detailed description is not possible.

Convalescent Home, Broadstairs.—This building occupies a site on the top of the cliff to the west of the town of Broadstairs, facing the sea. The plan is a rectangular block enclosing a central quadrangle. The rooms are all placed on the outside of the block, and the corridor and staircases, and also the projections for water-closets and bath-rooms, are placed on the inner or quadrangle side. The ground floor on these sides contains day-rooms for patients, work-rooms, kitchen offices, refectory for children, play-rooms, rooms for staff, and the doctor's room and dispensary. The south side is taken up for the greater part of its length by the chapel, with chaplain's room, &c. On the first floor on three sides are dormitories for patients, a large schoolroom, rooms for nurses and teachers, with lavatories, water-closets, &c. The fourth side is the upper part of the chapel.

Convalescent Home, Coatham, near Redcar.—This Home was founded by the late Rev. John Postlethwaite in the years 1860 and 1861. A remarkable feature in the institution is that not only are the patients "provided with medical attendance, board, lodging, washing, baths and everything necessary for health and comfort," free of charge, but that "the whole of the nursing is conducted by ladies who give their voluntary services, and there are no payments for official and management expenses to anyone" (Statement for 1888). The building has been much added to since its foundation, and it now provides accommodation for 180 patients.

Convalescent Home, Hunstanton.—This building was erected in 1879, and contains sixty beds. The plan shows a front building two storeys in height with a back cross-shaped wing of one storey only. The front buildings contain the day-rooms, two small wards, the board-room, and matron's room on the ground floor, and remainder of the wards with nurses' rooms, &c. above. The back building contains the kitchen offices, and the part connecting the front and back is the dining-hall. The water-closets are all inside the building, and the wards are ordinary rooms.

Convalescent Home, St. John's Hospital, Weston Favell, Northampton.—In general form, the plan resembles a T turned upside down. The building is mainly one storey in height. The entrance is in the centre, and a corridor runs from end to end of the building at the back. The ground floor contains the matron's rooms, doctor's room, committee-room, two dormitories for two beds each, and two for four beds each, two day-rooms, and bath-rooms, lavatories, and water-closets for each sex. At the back of the centre is the dining-hall and beyond this are the kitchen offices. A small part of the front building has an upper storey which contains two dormitories for four beds each, and three nurses' bed-rooms. There is a detached chapel.

Convalescent Institution, New Brighton, Cheshire.—This building is a single straight block, with a projecting tower containing the bath-rooms and water-closets. The institution is for the reception of women and children only : patients recommended by a subscriber pay at the rate of 6s. 6d. per week ; the terms for those not recommended being 10s. 6d. A certain number of patients are provided with special accommodation at a rate of £1 1s. per week, or 15s. if recommended by a subscriber.

Hertfordshire Convalescent Home, St. Leonard's-on-Sea.—This is a building of the villa type, and is situated on rising ground at the extreme western end of the sea front of St. Leonard's. The site is about an acre in extent. The entrances for men and women are at opposite sides of the building, and a separate staircase is provided for each sex. On the ground floor are two large reading-rooms, one for each sex, a general dining-room, matron's sitting-room, and the kitchen offices. On the first and second floors is a series of dormitories giving accommodation for forty beds.

Hospital of St. Andrew, Clewer.—This is an irregular-shaped block of buildings, and may be said to consist of two blocks, a long front building, having wards at one end and the chapel at the other, and a building at the back of the chapel containing the kitchen offices and wards for children. The buildings are for the most part two storeys in height. The accommodation for men consists of a large ward for twenty-one beds, and a small ward for four beds. For women there is a ward for twelve beds, and a small ward for six "penitents." The ground floor under the chapel is partly occupied by the men's dining-hall, partly by that for the sisters. There is a large day-room for children, and a dormitory adjoining. Above are rooms for sick and aged sisters.

Kilmun Convalescent Home, Holy Loch, N.B.—This institution was erected and is managed by the Glasgow Abstiners Union. It contains eighty beds. The buildings consist of three detached blocks. The centre block contains, on the ground floor, the matron's parlour and sitting-room and the kitchen offices, and on the upper floor a large dining-room. The side blocks form each practically two semi-detached houses. Each house is divided down the centre by the entrance lobby and staircase, and has on each floor two double bedrooms. The closets are on the earth system, and are outside the building.

Lincolnshire Seaside Convalescent Home, Mablethorpe.—This institution was built in 1871, from the designs of Mr. James Fowler of Louth. The building consists of a long front block, the centre portion of which is set back, and three projecting wings at the back. The wards are all small rooms. A noteworthy feature is the arrangement of the water-closets, which are all placed in projecting wings, and with some attempt at disconnection. The building has been designed with a considerable amount of care, and seems well adapted to its purposes.

Metropolitan Convalescent Institution, Children's Branch, Kingston Hill.—The plan of this building is of the reversed T form, and belongs to the single pavilion type. The building is three storeys in height, with a central tower rising considerably above the wings. The main entrance is in the centre; to the right of the entrance hall are the matron's room and officers' room, with passage between, leading to the boys' day-room. From this a porch leads into the playground; the water-closets are in a wing at the end of the day-room, but are entered only from the outside. To the left are a cripples' dormitory for two beds and visitors' room, with a passage between leading to the girls' day-room, which is arranged like the boys'. At the back of the entrance hall is the dining hall, and beyond this are the kitchen offices. The first and second floors provide dormitory accommodation for 146 children—seventy-three of each sex. On each floor the arrangements are the same; the staircase occupies the centre, to the right is a dormitory for three beds, with the matron's bedroom leading out of it, and two large dormitories leading one out of the other with the beds arranged in rows of six between the opposite windows. On the left is an officer's bedroom, a bath-room, a sink-room, and two dormitories similar to the last. The planning of these dormitories is very faulty, the placing of six and seven beds between opposite windows being a

particularly bad arrangement, only tolerable in workhouses, and then only on the score of necessary economy. There is a dormitory at the back, with only two rows of beds between the windows.

Metropolitan Convalescent Institution, Seaside Branch, Bexhill.—This building is the seaside branch of the parent institution at Walton-on-Thames. It affords accommodation for fifty men and fifty women, and was built in 1879 from the designs of Sir Arthur Blomfield, A.R.A. The building itself is a large rectangular block, with slightly projecting wings at each end. The ground floor is occupied by day-rooms, dining-rooms, and rooms for matron and visitors; the upper floors contain the wards. None of the wards have through-ventilation, and the corridor on the first floor is long and is lighted mainly by borrowed light. The water-closets are all inside the building.

New Convalescent Hospital, Southport.—This building consists of a large square block enclosing four courtyards, which become one large open space on the first floor and a quadrangle enclosed on three sides only on the upper floor. The building is placed at an angle of 45° to the compass, and is bounded on the south-east and north-east by streets. The ground floor is thus arranged: the main entrance is in the centre of the north-east front; passing through the entrance hall the main corridor is reached, which runs from end to end of the north-east and the north-west blocks and half the length of the south-west block. The rooms are arranged on the outer side of the corridor only, to the left of the entrance are dormitories, reception-room, and porters'-room, to the right are visitors' room, surgeons' rooms and dispensary, and committee-room. The north-west side is occupied by dormitories and day-rooms, and half the south-west side by day-rooms. The remainder of the south-west side is occupied by the dining hall, which is as wide as the day-rooms and corridor combined. On the south-east side, next the dining hall, are the servants' hall and the office and weighing-room; next the latter is the kitchen entrance, and beyond this is the master's house. These rooms complete the outer quadrangle of building. A corridor bisects the whole building, and runs from the entrance on the north-east to the opposite side. In the centre of the quadrangle formed between this corridor and the north-west side is a block containing two sets of bath-rooms, with lavatories, water-closets, &c. On the other side of this corridor is a range of rooms, comprising a mortuary, another set of bath-rooms, engine-room, linen-room, store-room, and still-room. At the side

of the dining hall are the kitchen offices and stores ; next to these there is a small courtyard, followed by the laundry. The court formed between this latter and the south-east block is the master's garden. The first floor, except where the upper part of the dining-room occurs, is entirely devoted to dormitories, some of which are cubicles. The top floor also is entirely occupied by cubicles.

New Semi-convalescent Hospital, Cookbridge, near Leeds.—This institution was erected by Mr. John North, as a Jubilee gift, for the reception of semi-convalescents from Leeds Infirmary. The plan belongs to the double pavilion type, and resembles Swansea in having the wards placed at an angle to the central block. The whole of the accommodation for patients is on the ground floor, the upper storeys of the central block being devoted to nurses' and servants' rooms.

North of England Children's Sanatorium, Southport.—This building was erected in 1875 from the designs of Messrs. Mellor and Sutton, architects, of Southport. In plan it takes the form of a rectangular U, and is three storeys high. It has accommodation for seventy patients. The wards are larger, and for the most part better ventilated, than in many institutions of the kind, but the position of the water-closets inside the building and close to the wards leaves much to be desired.

Prudhoe Convalescent Home, Whitley, Newcastle-on-Tyne.—This belongs to the multiple pavilion type, and, except that the wards are not alternated, somewhat resembles the plan of the institution at Blackburn. The central front building contains the residential quarters for the staff. At the back the main corridor runs right and left at right angles, and gives access to two blocks on each side containing dormitories and day-rooms. These blocks are two storeys in height, and in the spaces between are balconies facing the sea. At the back of the central block are two corridors giving access, one from the men's side, the other from the women's side, to the general dining-room, and occupying the space between the two corridors are bath-rooms for each sex and the engine-house. Beyond the dining-room are the kitchen offices, and beyond these again the laundry, with an open yard intervening. The building occupies a site of nearly four acres within a short distance of the sea.

The "Rest" Convalescent Home, Porthcawl, near Bridgend, Glamorganshire, is a small institution of forty-four beds, erected in 1877, from the design of the late Mr. John Prichard of Llandaff. There is nothing of special note in the arrangements, except that

the closets are on the dry-earth system, and are quite outside the building.

St. Agatha's Convalescent Home, Reigate.—This is a small institution for sixty-four beds, in connection with the Church of St. Peter, London Docks. It consists of a rectangular block, with a central corridor and a staircase at each end, the dormitories being arranged on each side of the corridor, and the water-closets placed off the staircase.

St. Bartholomew's Hospital Convalescent Home, Swanley, Kent.—As its name implies, this institution is the property of St. Bartholomew's Hospital. In plan it consists of a long front block, with the wards projecting, and with a central projecting wing, and two side wings at the back, and a chapel connected by a corridor to one end. The front block contains, on the ground floor, the principal entrance, matron's room, committee-room, and medical officer's room, and five day-rooms; and on the first floor, eight dormitories and the matron's bedroom. A small portion of the centre has two additional storeys, and contains on the second floor two nurses' bedrooms, and a dormitory for patients, the latter being approached by a separate staircase. On the top floor are servants' bedrooms. The centre wing at the back contains the dining hall and kitchen offices, and the side wings contain cloak-room, lavatories, and water-closets on the ground floor, and lavatories, bath-rooms, and water-closets above. There is also a laundry in the grounds, at which the work of both hospital and convalescent home is done.

Seaford Convalescent Hospital.—The main building of this hospital is in the form of a cross, the male patients being placed in the right arm, and the female patients in the left arm. The central part is occupied, with the exception of two small dormitories for patients, by the administration offices and residences for staff. The kitchen offices are in a one-storey wing. The total accommodation would appear to be twenty-six beds.

Suffolk Convalescent Home, Felixstowe.—This institution was first started in an old wooden house in 1868, and to this a new wing was added in 1884. The new building is four storeys in height, and contains in the basement the kitchen offices, stores, and men's smoking-room. On the ground floor are the men's dining-room and sitting-room, waiting-room, matron's sitting-room, and water-closets and lavatory. On the first floor are two dormitories for men, of seven beds each, lavatory, bath-room and water-closet (combined), and matron's bedroom, and on the second floor are similar

dormitories and two small bedrooms. The accommodation for female patients is wholly in the old building.

Woodlands Convalescent Home, Rawdon, near Leeds.—This Home was erected in 1877 by Henry W. Ripley, Esq., M.P., the architects being Messrs. Andrew and Pepper, of Bradford. The buildings, which are designed to accommodate 120 persons, are in the form of a cross. The greater part of the central portion is occupied by a large conservatory and a dining hall, each one storey only in height. A large day-room, 60 ft. by 30 ft., is provided for each sex, and there are a reading and smoke room for men, and a reading and work room for women. The wards are moderate-sized rooms entered from a corridor, and the water-closets, though placed in projecting wings, are not cut off from the rest of the building. Externally the building is a handsome structure, and great care has evidently been taken to fit it for its uses.

British Convalescent Hospitals.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Barnes Hospital, Cheadle	133	6'50	71'34	14'33	1,022'30	10'00	4,094'00
Prudhoe Convalescent Home	140	—	91'00	—	—	—	—
Southport	—	—	—	—	—	—	—
St. Bartholomew's, Swanley	71	6'25	75'00	14'50	1,087'50	—	9,342'00
Atkinson Morley, Wimbledon	100	8'00	95'83	14'50	1,389'23	18'88	12,161'40
New Brighton, Cheshire	—	—	—	—	—	—	—
Felixstowe	60	—	69'42	—	—	—	—
Seaford	26	6'00	59'72	—	—	—	—
Weston Favell	—	—	—	—	—	—	—
Hertfordshire, St. Leonard's-on-Sea	—	—	—	—	—	—	—
Metropolitan, Kingston Hill	—	—	40'32	—	—	—	—
„ Bexhill	100	—	74'40	11'75	874'00	—	1,306'80
Cookbridge	42	{ 8'00 6'00	{ 94'50 —	{ 13'50 —	{ 1,275'75 —	{ 15'10 —	{ — 837'00
Hunstanton	60	—	68'00	—	—	—	—
Mablethorpe	40	—	105'00	12'00	1,260'00	24'50	2,178'00
Coatham, near Redcar	180	—	—	—	—	—	—
Porthcawl, near Bridgend	44	—	—	—	—	—	—
Kilmun, Holy Loch, N.B.	80	—	143'75	10'00	1,437'50	—	535'70
Southport (Children)	70	—	—	—	—	—	—
Woodlands, Rawdon, near Leeds	120	—	—	—	—	—	3,630'00
St. Agatha's, Reigate	64	—	80'00	9'50	760'00	12'83	239'34
St. Andrew, Clewer	96	{ 10'00 7'00	{ 100'57 —	{ 15'00 —	{ 1,508'00 —	{ — —	{ — —
All Saints', Eastbourne	—	{ 11'00 8'00	{ 117'00 —	{ 17'00 —	{ 1,989'00 —	{ — —	{ — —
Broadstairs	—	—	—	—	—	—	—

* Coupled beds.

(8). MINERAL-WATER AND SEA-BATHING HOSPITALS.

Bath General or Mineral-water Hospital.—This hospital was opened in 1742, amongst the original promoters of the charity being the celebrated Beau Nash. The objects of the institution are defined to be “the relief and support of poor persons from any part

of Great Britain and Ireland, afflicted with complaints for which the Bath waters are a remedy." These complaints are rheumatism, gout, paralysis, and nervous derangements in which the brain is not specially affected, leprosy and other diseases of the skin, mineral poisoning, weakness or rigidity of the joints, dyspeptic complaints, amenorrhœa, and dysmenorrhœa. The buildings consist of two large blocks, one being a rectangle, the other an unequal-sided figure enclosing a courtyard. These buildings are placed side by side,—that to the east (the older one) being for women, that to the west for men. In the absence of sufficiently accurate plans, it is impossible to describe these buildings in detail.

Devonshire Hospital, Buxton.—The Buxton Bath Charity, of which this hospital is a modern outgrowth, is of very ancient date. Its existence is mentioned in "The Treasury of the Bath," A.D. 1572, but there is little doubt that the healing properties of the Buxton water were known at a period long antecedent to that date. The hospital was established in 1859 to provide proper care and accommodation for the constantly increasing number of patients who thronged to obtain relief from the waters. The plan of the building is peculiar and possibly unique. A large square block with the corners cut off, thus forming it into an irregular octagon, surrounds a central circular-domed hall 164 ft. in diameter. A colonnade within this circle encloses a space 13 ft. in width. In the centre of the dome, at a height of 70 ft. from the floor, is a ring 40 ft. in diameter, from which rises a lantern light 18 ft. high, crowned with a ventilator, the height from the floor to the top of the ventilator being 103 ft. The superficial area of this hall is just half an acre; it is capable of holding 6,000 people, and its cubical contents are about 1,000,000 ft. The buildings surrounding this central hall are two storeys in height. The entrance is on the south side, and here are placed the consulting-rooms, dispensary, resident medical officers' rooms, board-room, waiting-room, and secretary's office. At the south-east angle is the ward for women, and the corresponding angles to the north-east and north-west are day-rooms. On the west side are separate entrances for men and women, galvanic rooms, wards, &c. The kitchen offices are placed in a separate building approached by a covered way, and on the upper floor of this block are isolated wards for infectious cases. The upper floor of the main building contains wards for patients, approached from a gallery in the central hall, and bedrooms for resident staff. The total accommodation is for 300 patients.

Harrogate Bath Hospital.—This hospital was erected in 1824 “for the relief of poor persons from all parts of Great Britain and Ireland, whose cases require the use of the various mineral waters and baths of Harrogate.” “The cases usually admitted comprise chronic skin diseases, diseases of the liver, gout and chronic rheumatism.” *

Royal Sea Bathing Infirmary, Margate.—This hospital was founded in 1791 by Dr. John Coakley Lettsom, M.D., for the scrofulous poor of all England. Beginning with 16, it now accommodates 220 patients. The buildings are arranged in the form of a quadrangle, with one of its sides, that facing west, prolonged beyond the square, the extension towards the south being more than twice as great as that towards the north. The enclosed quadrangle forms a garden, and around all four sides is a covered-in verandah. At one end of the south wing is a large tepid sea-water swimming-bath. Beyond this stands the chapel, facing east and west. These two latter, and the whole of the new wards forming the west side, owe their existence to the munificence of the late Sir Erasmus Wilson. The wards are large, containing seventeen beds each, are cross-ventilated, and open on one side on to the verandah above mentioned. The water-closets are not disconnected in any way from the wards.

British Mineral-water and Sea-bathing Hospitals.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
		ft.	ft.	ft.	ft.	ft.	ft.
Bath	—	—	—	—	—	—	—
Buxton	300	—	—	—	—	—	—
Margate	220	—	100'00	14'00	1,400'00	22'40	1,584'00
Harrogate	50	—	76'00	—	—	—	3,484'40

(9). VARIOUS SPECIAL HOSPITALS.

Under this class it is proposed to consider all those special hospitals for the separate existence of which no good case can be made out. It must not be assumed, however, that this wholesale condemnation is meant to imply that some, at any rate, of the hospitals which will be described have not done, and are not now doing, most valuable and beneficent work as teaching centres as

* *Report*, 1883.

well as institutions for the relief of the suffering poor. The error that it is intended to point out is their original foundation as separate institutions, owing to the shortsightedness and conservatism of the authorities of the larger general hospitals, who failed to establish special departments until their hands were forced from outside. The most typical example of the evils of special hospitals is the existence in London to-day of two small hospitals, containing between them less than forty beds, for the treatment of diseases that can be and are treated in the wards of every general hospital.

(a) Throat and Ear Hospitals.

Central London Throat and Ear Hospital, Gray's Inn Road, London.—This is a small building, consisting of two old houses re-arranged for their present purposes. The ground floor is devoted to the out-patient department, office, and operating-room. On the first floor are the kitchen, pantry, matron's rooms, and two wards with bath-room and water-closet. The second floor contains three wards, a day-room, nurses' room, and the same arrangement as to bath-room, &c., on the lower floor.

Hospital for Diseases of the Throat, Golden Square, London.—This is practically a house at the corner of Golden Square and John Street. The plans explain themselves. It will be seen that there is no attempt to cut off the water-closets from the wards, and that the wards are in direct atmospheric communication with the out-patient department and the kitchen.

(b) Lock Hospitals.

The Female Lock Hospital and Asylum, London.—The origin of this charity is involved in some obscurity. The date of foundation is given by Highmore* as the 4th July, 1746, and this date is adopted by the hospital authorities. The records of the hospital itself, however, show that patients were certainly admitted previously to 1720, and in a work entitled "A complete History and Survey of the cities of London and Westminster, the Borough of Southwark and parts adjacent, from the earliest accounts to the year 1770," it is recorded that the leper house formerly belonging to St. Bartholomew's Hospital† was then (1770) appropriated to the cure of venereal patients and was called the "Lock Hospital"; and that it was "built about 120 years ago." This is also the earliest record of the use of the name "Lock," as to the meaning of which

* *Charities of London*, vol. i.

† See Art. "St. Bartholomew's Hospital."

there are two theories. One is that when this building was devoted to lepers, the patients were kept under restraint, hence lock ; the other, which is adopted by Highmore, is that the word is a corruption of the French *loque* or filthy rags. The asylum was founded in 1787 by Rev. Thomas Scott, the commentator, who was then chaplain of the hospital, as a refuge for those desirous of giving up their evil life, and after a time of being restored to their friends or helped to make a fresh start in life. In 1842 the hospital and asylum were removed from Hyde Park Corner to Westbourne Green, Paddington, the present site, the new buildings being arranged for a hundred patients, fifty in the hospital and fifty in the asylum. In 1847 the chapel was opened for Divine service, and in 1849 a new wing was opened for the asylum. In 1862 a separate building for male patients was opened in Dean Street, Soho, where also an out-patient department for both sexes was established. In June, 1867, another wing was opened as the Female Hospital, and the accommodation was then raised to :—

Hospital for female patients, Westbourne Green	180
Asylum " " " "	100
Hospital for male patients, Dean Street, Soho	20
Total 	<u>300</u>

The building consists of a long straight block, with central corridor and two wings, one at each end, and the chapel projecting out in the centre. On the ground floor, the east wing contains the main entrance and resident officer's and matron's rooms. The central portion contains secretary's offices, ladies' committee-room, kitchen offices, dispensary, patients' waiting-room, vestry and ante-room to chapel. The west wing contains the asylum, dining-room, laundry, washhouse and mangling-room. On the first floor the east wing and the greater part of the central portion is devoted to sick wards and nurses' rooms. There is no disconnection between the wards and the closets, and there is a room in close proximity to the wards called the "foul linen-room"—a most objectionable feature. A small portion of the central part is devoted to the asylum probationers' work-room and asylum clothes-room, and the east wing contains the asylum dormitories. At one end of the latter a water-closet is placed in the corner, opening directly into the dormitory.

Glasgow Lock Hospital.—The site upon which the hospital

stands is a small one, and the front building stands between two adjoining houses. The back building is separated from the front block by a narrow courtyard, which is cut in two by a connecting piece containing water-closets, &c. For so small a building the total number of beds, eighty, appears very large.

Manchester and Salford Lock and Skin Hospital.—This hospital consists of two dwelling-houses thrown together, with a wing built out at the back. It would not appear that the institution is in any sense an asylum.

Town Hospital and Lazaretto, Norköpings, Sweden.—This is a building of the E form and contains three storeys and an attic storey over part. In the basement are cellars, store-rooms, offices, rooms for mental cases, the boiler, and disinfection-house. On the ground floor is the main entrance hall, with the committee-room and office to right and left. The central wing at the back contains the kitchen offices, a bath-room, and a staircase. At the back of the main block is a corridor running the whole length of the building, in front of which are seven wards, the operation room, and doctor's room adjoining. Each of the end wings contains a general ward for sixteen beds, two nurses' rooms, a large kitchen with two water-closets leading out of it. The arrangement of the first floor is very much the same, except that, in place of the entrance hall, committee-room, and office, is a large "reserve" ward, and the rooms over the operation room and doctor's room are wards for three beds each. The central wing contains a ward for eight beds, two nurses' rooms, and a lift. On the attic floor are two wards for five and nine beds respectively, a nurses' room, and store-rooms. The hospital was completed in 1878, but was not fully occupied until July, 1881.

(c) Eye Hospitals.

Of the necessity for separate hospitals for the treatment of eye diseases, there appears to be some divergence of opinion amongst surgeons. It is urged on their behalf that eye cases must be treated in separate wards, and that small wards are more suitable than large ones. On the other hand it is shown, and with perfect truth, that eye cases can successfully be treated in small wards in general hospitals, and it is contended that there is no sufficient ground for removing from the clinical practice of the general hospital the material for so important a branch of study.

The enormous number of out-patients who attend at eye

hospitals is one fact that perhaps more than any other supplies a *raison d'être* for the institution in question. But properly considered, this fact really only points to the desirability of branch dispensaries or out-patient departments, not to complete hospitals.

Birmingham and Midland Eye Hospital, Birmingham.—This hospital occupies a restricted site at the junction of three streets. The site is oblong in shape, and on the ground floor the whole of the land is covered. The entrance is in the centre of the longest front, and at the back, filling up the space that is open above, is a large waiting hall for out-patients. To the left of this are a large consulting-room, three small rooms for minor operations, and two ophthalmoscope-rooms. To the left are the dispensary, entrance and exit for out-patients, and their water-closets. The remainder of the ground floor is occupied by the offices, surgeon's room and staircase. The first floor contains three small wards, nurse's room, matron's bedroom and women's day-room, and pantry, with a separate staircase to all the foregoing. In the centre is a second staircase giving access to the house-surgeon's rooms, the matron's sitting-room and linen-room. The left wing contains a very large men's day-room, a smoking-room, boys' room and pantry, and to these a third staircase gives access. Although there are three staircases, the whole floor is in communication, one part with the other, by doors in the corridors. The second floor contains wards for both sexes, and the third floor contains wards, kitchen offices, and museum. The very restricted nature of the site obviously presented great difficulty in getting the necessary accommodation, but the provision of three staircases seems an unnecessary waste of space which might possibly have been utilised to better advantage. The water-closets, too, are insufficiently separated from the wards.

Eye and Ear Infirmary, Liverpool.—This somewhat ornate building was erected in 1879-80. It consists of a single block in the rectangular U form, and stands at the corner of Myrtle and Side Streets. The front portion facing Myrtle Street is bisected through its entire length by a corridor, with a staircase at either end. The basement contains the kitchen offices and stores in the front portion, two covered airing-courts in the right wing, and a laundry under a portion of the left wing. On the ground floor the front part is devoted to residences for officers, the main entrance, with porters' room and waiting-room, and the board-room. The left

wing is divided longitudinally by a partition, on each side of which is a ward with one row of beds. The beds are coupled ; there is no means of through-ventilation, and the water-closets are practically in direct communication with the wards. At one end of the ward is a nurse's room, with lift from the basement opening into it, and a one-bed ward. The left wing contains the out-patient department. The first floor contains in the front part two large day-rooms, one for each sex, two private wards, nurses' rooms, and the operation theatre with a small waiting-room and a recovery-room attached. The left wing contains a ward for twenty beds, with the lavatories, bath-room, and water-closets at the end, but without any attempt at disconnection being made. The beds are placed in couples as in the ward below, and down the centre of the ward is a low partition with iron columns. The right wing is similar to the last, but not so large, the ward holding only sixteen beds. The second floor is similar to the last, except that the day-rooms are smaller, and that there are eight bedrooms, four of which occupy the space taken up below by the operation theatre. The attics are servants' bedrooms. The arrangement of the beds in the wards is particularly bad, the space between them being (according to the plan) only about 6 in. ; and there can be no excuse at all for the faulty planning of the water-closets. The *raison d'être* of the partition is not easy to divine ; it is very difficult to see what good purpose it can serve.

New Eye Infirmary, Newcastle-on-Tyne.—This hospital, as its name implies, is of recent date, having been erected in 1885. The plan is a square block with small wings at each end containing bath-rooms and water-closets. The ground floor contains the out-patient department, part of which is a one-storey projection, the board-room and kitchen offices. The first floor contains two dormitories, a day-room with "ambulatory" on the flat roof over the out-patient department, and a nurse's sitting-room. The water-closets are not sufficiently detached from the wards.

New Eye Infirmary, Wolverhampton.—This hospital was opened in October 1888. The buildings consist of a main block with a wing for out-patients. The main block is planned in the form of the letter E, is three storeys high, and is of the corridor type. The kitchen offices are placed in the basement, and the wards are partly on the ground floor, partly on the first floor. The out-patient department, besides occupying the wing above referred to, extends partly under the main block, and is in direct communi-

cation therewith. There is an operation room on the first floor. The water-closets, &c. appear to be separated by lobbies from direct contact with the wards.

Royal London Ophthalmic Hospital.—This large and important hospital was founded in 1804, and additions to the buildings have been made in 1861, 1862, 1876 and 1879. The site is at the corner of Blomfield Street and Eldon Street, and is an irregular four-sided figure with a small triangular annexe on one side. On the ground floor the whole extent of the site, with the exception of a large area in front, is built over. On the first floor the building takes the form of a T. The ground floor contains residences for staff, board-room, lecture-room, and out-patient department. The entrance to the latter is at one side. Male and female patients all enter at the same door, and passing along a narrow passage arrive at a large waiting-room where the male patients are separated from the females by a dwarf screen. Communicating by two doors with the waiting hall is a large consulting-room to which the patients are admitted in batches. The surgeons are placed at desks on the opposite side of this room and in front of the large windows, which receive light from over the roofs of the three small waiting-rooms shown on the plan. The patients requiring further examination are passed on to one or other of these waiting-rooms, and thence to the ophthalmoscope room behind. When dismissed from the latter they pass out through the end waiting-room to the lobby through the spectacle-room, where they are supplied, if necessary, with glasses; thence, if men, they pass to the left hand of the clerk's box, if women to the right, to the dispensary. The first floor contains five wards, an operation room, and two ante-rooms, house-surgeon's sitting-room, two nurses' rooms, and curator's room. The latter is accessible on this floor only by crossing the lead flat roof over the waiting room. None of the wards have through-ventilation, and the water-closets are not disconnected from the corridors with which they communicate.

This hospital is shortly to be rebuilt and considerably enlarged from the designs of Mr. Keith Young, acting in conjunction with the surveyor to the hospital, Mr. Bedells.

The Royal Eye (South London Ophthalmic) Hospital.—This hospital, which for many years occupied small and most inconvenient premises in St. George's Circus, S.E., has recently been rebuilt. The site, which includes that of the old building, is about four times the area formerly occupied, and has frontages to St. George's Circus

Westminster Bridge Road, and Waterloo Road. The planning of the new building is necessarily rather complicated, and will be understood best by following with the aid of the plans the course of an out-patient from entrance to exit, and then taking the in-patient department separately. Before doing this it is necessary to point out that one main principle in the design is that the out-patient department must be entirely separate from the in-patient part ; and another essential rule governing the arrangement of the out-patient department is, that patients, many of whom are blind or semi-blind, must be guided as much as possible from one point to another, and must in no case cross each other or retrace their steps. To begin, therefore, with the out-patient arrangements. The entrance for out-patients is on the ground floor, or rather pavement level, at the Waterloo Road end. Passing up a passage-way, screened off from the public entrance to Obelisk Yard by a wire-work partition, the patient finds himself in a narrow passage, on the right-hand side of which, close to the entrance, is a window in the partition enclosing the office. At this window he obtains his letter, and then passes down a staircase, and, turning to the right again, finds himself in the waiting hall. In all the staircases and passages the width is kept sufficiently small that a person can touch each side if a passage, or if a staircase can hold the hand-rail on each side, and so guide himself along. The waiting hall is not yet permanently seated, but will be provided with seats so arranged that the patients must pass one way only. At the further end of the hall are four sets of water-closets, one set each for old patients, male and female, and one set each for new patients, male and female. In each case the entrance is by a door opening outwards only, and the return by a door opening inwards only, and as the closets are some feet below the hall floor, handrails for the patients' guidance are provided. The double staircase shown near the end of the waiting hall gives access to the ground floor. One side leads up to the north consulting-room, the other to the south consulting-room. The patients, therefore, are, at the foot of the stairs, divided into two streams, one stream going to one medical officer, the other stream to the other. Each consulting-room is lighted by a large semi-circular-headed window filled with one sheet of plate glass. For the use of each medical officer there are two small recesses formed with slate partitions for ophthalmoscopic work, and an examining-room, and, accessible from both consulting-rooms is a bandaging-room. Here it should be noted that a patient enters the examin-

ing room by one door, and leaves by another, and the same with the bandaging-room, and that the doors in each case have been carefully arranged so that they open with the stream of patients, and in no case can a patient going in the proper direction impinge upon the edge of an open door. A patient having been seen by the medical officer, now passes along the curved passage way outside the main staircase of the hospital to a smaller waiting-room, where, if necessary, he goes into the spectacle-room to be fitted with glasses, or wait his turn to get his medicine at the dispensary. From thence he passes down the staircase and along the passage under part of the spectacle-room, through a turnstile, and out into the street.

In order to make clear the point about absolute severance between the out- and in-patient departments, it should be noted that the only access to the waiting hall, other than the patients' entrance, is by way of two doors leading into the open yard, one close to the lift, the other opposite the foot of steps leading from Obelisk Yard. On the ground floor the only communication with the rest of the hospital is by the door close to the south examining-room opening on to the porch. This door is intended for the use of the medical staff. The windows shown along the curved wall of the main staircase looking into the passage are for light only. They are of iron and glass, and are fixed. Returning now to the basement, at the Waterloo Road end of the site is the boiler-house, engineer's shop, and disinfecting-chamber. To the north of the waiting hall is a bath-room, with two baths and a water-closet, and office for the reception of stores. On the opposite side of the yard is a large store-room and a room for dirty linen. Ample storage room also is provided in the spacious vaults under the pavement. To the left of the out-patient entrance on the ground floor is a small self-contained two-storey house for the engineer. Over the boiler-house is a shop with a mezzanine floor, which it is intended to let as a temperance restaurant. The main entrance to the hospital is by the open porch in the centre of the Westminster Bridge Road front. On one side of this porch is the entrance for the staff before referred to. On the other is a door leading into a room intended for use as an isolation room for separating cases of infectious disease until fetched away by ambulance. In the rare occurrence of the death of a patient this room could also be used as a mortuary. It is entirely lined with glazed bricks and tiles, has an asphalt floor, and is provided with a gas furnace for destroying fæces. Facing the

visitor is the main entrance to the in-patient portion of the hospital. Immediately inside the front door is a corridor, at one end of which is the secretary's office. The semi-circular block of brickwork, around which the staircase winds, contains the smoke flue from the boilers, the space around which forms a ventilation flue from the basement. The staircase is planned in the form of a semi-circle, and within the two enclosing walls are two flights, one to be used exclusively for ascent, the other for descent. Each flight has a hand-rail at each side, and at the top and bottom of each flight swing bars will be arranged, which will prevent anyone from going up the descending staircase or down the ascending one. The first floor contains the resident house-surgeon's rooms, registrar's room, three single wards for paying patients, an operation room, the matron's room, the pantry and the linen-store. These all are entered from the corridor. At the Waterloo Road end of the building is a laboratory, which is entered by crossing the flat roof over the medicine waiting-room and the engineer's quarters. Two small wings project from the staircase building; in one of these is a water-closet and a slop sink, in the other a water-closet and a shower bath. The construction of these wings is somewhat novel, and sanction for it had to be specially obtained from the London County Council. In order to economise space it was desirable to restrict the thickness of the enclosing walls to nine inches; and in order to obtain as free a circulation of air as possible about this part of the building, it was further desired to keep the height of the water-closets to the necessary minimum of 7 ft. With a building of four floors in height, it was impossible to do this in brickwork, or, indeed at all under the provisions of the Building Act. The permission of the County Council was therefore sought and obtained to construct these buildings with an iron framework filled in at each floor with nine-inch brickwork roofed over at the required level, and leaving between each roof and the floor of the closets above an open space of some four feet. On the second floor are two large wards for eight beds each, three single-bed wards, a duty-room, and an operation room. The third floor is similar in all respects. On the fourth floor are the kitchen offices, and rooms for nurses and servants. The roof is an asphalt flat, designed to be used as a recreation space for patients and staff. There are in all five lifts. One lift, which starts from the basement and finishes at the roof level, is intended mainly for the conveyance of stores to the several floors; it is also designed to be used for the conveyance of

patients up to the wards, or from thence to the bath-room in the basement. It is entirely outside the building, and is formed of open lattice-work iron framing ; the motive power is hydraulic. From the flat at the level of the first floor a hand-power ascends to the kitchen for the conveyance of meals to the several floors. This also is outside the building, and is enclosed in a lattice framework. A specially devised lift, consisting of a cage working on a rod, passes from the dispensary waiting-room, through the flat roof, over to the level of the window sills of the first floor. This is for sending medicine up to the first floor, whence it will be distributed by hand to the various rooms on all floors. A small lift is devised, in the recess marked E on the plan, for sending letters, &c. up to the various floors. Lastly a lift for the conveyance of instruments will be fixed from the operation room on the second floor to that on the third floor. In the construction of the building fireproof materials have, as far as possible, been used throughout. The floors are of iron joists embedded in concrete, and the staircase is of concrete. The roof is of concrete and iron, finished with asphalt. The walls throughout the out-patients' department are lined with glazed bricks. In the waiting hall the floor is of asphalt, and is laid to slope to an open channel covered with an iron grating, so that the whole place can be flushed out with a hose. All angles throughout the building are rounded, and ledges or places on which dust could lodge have been, so far as possible, avoided. The building is warmed throughout by hot water, and, except in the engineer's house, there are no fireplaces anywhere. The coils have been specially designed for the work, and are made with a view to occupying as little space as possible. They are cased in with sheet-iron covers, which are made easily removable, and in which the angles are all rounded. Fresh air is brought in from the outside to the coil-casing, and the openings in the latter admit the fresh warmed air into the rooms. In all rooms extraction-shafts are placed, their areas varying according to the size of the rooms. The building is being fitted with electric light throughout, gas being also laid on to certain parts for use in case of need. A very complete system of electric bells has been fitted, communicating with a central indicator, a press being provided at the head of each bed in the wards. There is also a telephone with central switch-board and speaking tubes for communication along short distances.

The architect for the building is Mr. Keith Young, who has been assisted throughout by Professor McHardy, one of the surgeons to

the hospital, to whose valuable initiative and co-operation most of the special features of the building are due.

Royal Westminster Ophthalmic Hospital.—This hospital dates from 1816. It occupies the apex of the nearly triangular block of buildings of which Charing Cross Hospital forms the base. The building is a square block of four storeys in height (including basement) and its arrangements do not call for any special description. The practice here is open to students of Charing Cross and Westminster Medical Schools.

(d) Diseases of Women.

The main reason alleged in support of this class of special hospitals is that the operation of ovariectomy cannot with safety be performed except under special circumstances which are not readily available in all general hospitals. But for diseases which can be and are treated in general wards, the existence of special hospitals is not a necessity.

Chelsea Hospital for Women.—This building was opened in July 1883. It is intended for the reception of poor patients who are unable to contribute towards the expenses of their treatment, and also of those patients who are in a position to pay either part or the whole cost. It consists of a single oblong block, with narrow frontage towards the Fulham Road, and means of light on all four sides. A corridor 8 ft. wide runs through the centre of the building from front to back, communicating on the south part with balconies on all the ward floors. The building is six storeys in height. In the basement is the out-patient department and the kitchen offices. The ground floor contains the board-room, matron's office and sitting-room, doctor's sitting-room and bedroom, a three-bed ward, and a day-room. The upper floors are all devoted to wards and nurses' rooms. The wards are of varying sizes, some containing eleven, some three beds. From the nature of the building none of these wards have through-ventilation, and the area and cubic space per bed seems unusually small. The water-closets are all inside the building, and the interchange of air between the different floors afforded by the staircase is increased by the shafts of two lifts, one for patients, the other for food, &c. The long central corridor, with free ventilation at either end, may possibly help to counteract the evils liable to be caused by the free passage of air from the basement to the upper floors.

Hospital for Women, Euston Road, N.W.—This hospital was erected in 1889-90. It stands upon a somewhat narrow site on the north side of the Euston Road, and consists practically of one long and irregular-shaped block. The main entrance is in the Euston Road. On the ground floor to the right of the entrance is a large room for the use of the medical institute. The corridor leading from the entrance hall gives access to the secretary's office, board-room, matron's rooms and the main staircase. Beyond these are the dispensary and the out-patient department, which occupy the ground floor of the circular ward block. On the first floor the building becomes more clearly defined into three parts. The front part is a ward for ten beds, with a bay window looking westward, and the water-closets and bath-room in a detached wing at the east. This ward is attached to the central block by a corridor, on one side of which are closets for linen, &c. The central block contains the staircase, a private ward for one bed, and another for two beds, two duty-rooms, bath-room, and operation room. At the further end of this block is another corridor, with cupboards on one side similar to those just described, and connecting this block to a circular ward for nine beds. The author of this design has borrowed largely from the plan of the Hastings Hospital, but it would have been well if he had more closely followed his model and avoided falling into the grave error of placing two enclosed lift-shafts in the centre of the building.

Hospital for Women, Shaw Street, Liverpool.—This hospital consists of two houses refitted and adapted for the purpose in 1883. The houses were, at the time, about thirty years old, and are constructed on the most expensive scale, having been formerly dwelling houses in the then most fashionable quarter of the city. The buildings are four storeys in height, including basement. The wards are rooms of varying sizes, having a total accommodation of thirty beds.

Hospital for Women, Sheffield.—This is a new building, erected in 1876, and is of a somewhat unusually ornate character. It consists of a long front block with a wing projecting at the back, on to which is placed a smaller cross block. From the meagre description that is available it appears that the institution comprises also a midwifery department with separate administration. The out-patient department occupies the ground floor of the front block. The wards appear to be all small rooms, and no attempt has been made to isolate the water-closets.

Hospital for Women, Soho Square, London.—This hospital was originally founded in Red Lion Square in 1842, and was removed to its present site in 1851. The buildings stand at the end of the block formed by the junction of Bateman's Buildings and Frith Street with Soho Square. Like the hospital at Chelsea, this institution is open alike to the poorest sufferers and to those who are able to contribute towards the cost of their maintenance. The buildings are partly old and partly new. They consist of two houses thrown together, and a new wing nearly as large as the two houses taken together. The ground floor is occupied by the out-patient department, the board-room, and the house physician's apartments, and the upper floors contain wards of varying sizes and nurses' rooms. The wards are ordinary rooms, and the water-closets are all within the building.

St. Mary's Hospital, Manchester.—The objects of this institution are—(a) the treatment of diseases peculiar to women and the diseases of children; (b) the attendance upon poor married women during pregnancy, and during and after labour; (c) the advancement of medical science and education; and (d) the instruction of medical students and midwives, and the training of nurses.

Samaritan Free Hospital, London.—This institution was founded and carried on in two houses in Upper Seymour Street, Portman Square, until in 1890 the new building it now occupies in the Marylebone Road was opened. The site is on the south side of Marylebone Road and the hospital possesses, in addition to the land on which the building stands, the two houses eastward and one house westward in Marylebone Road, and five houses in Walmer Street to the south. The house adjoining westward is now used as the out-patient department. The building contains in the basement the kitchen offices, dining-rooms for nurses and servants, and linen-room; on the ground-floor there are the committee-room, secretary's office, dining-room, matron's sitting-room, dispensary, and three wards; on the first floor there are the matron's bedroom, operation room, and six wards. On the second floor there are seven wards and a room for two nurses, and on the third floor two one-bed wards, a medical emergency ward and a surgical emergency ward, and nurses' bedrooms. The water-closets and baths are placed in two projecting wings at the back of the building, one wing being for the medical side, the other for the surgical side, and they are separated from the main building by cross-ventilated lobbies.

(e) Stone and Fistula.

For the separate treatment of these two diseases and their allies there exist in London two hospitals—St. Peter's for stone, St. Mark's for fistula, &c. There is no valid reason whatever for the treatment of these diseases in special hospitals.

St. Mark's Hospital, City Road.—This is a square block of buildings with light on three sides. The staircase occupies the centre of the block, and apparently derives all its light and ventilation from the top. The wards are of different shapes and sizes, and are in direct communication with each other and with the water-closets by two internal corridors, which have neither light nor ventilation except what is afforded by the doors of the wards.

St. Peter's, Covent Garden.—This striking and handsome building occupies a long and narrow site in Henrietta Street abutting at the back on the churchyard of St. Paul's, Covent Garden. The ground floor is, with the exception of the entrance hall and staircase in the centre, and the side staircase for out-patients, entirely occupied by shops. The first floor contains the out-patient department and offices, and the second and third floors contain wards. The attic floor contains bedrooms for nurses, &c. The water-closets and bath-rooms are placed in towers flanking each corner of the building, but there is no disconnection between the water-closets and the wards.

(f) Diseases of the Skin.

There are in London four hospitals and one dispensary for the separate treatment of skin diseases. None of these are in any sense of the word important institutions, nor is it at all desirable to give any detailed description of the buildings, which are all old buildings converted to their present uses.

In the provinces there are a few hospitals of this class, sometimes, as at Birmingham and Manchester, skin and lock being combined. In all it would appear that about twelve special hospitals for the treatment of skin diseases, either alone or in conjunction with lock, cancer, scrofula, or urinary diseases, exist in Great Britain.

(g) Homœopathic.

Homœopathic Hospital, Great Ormond Street, London.—This is, strictly speaking, a general hospital as regards the class of patients treated, but, in respect of the mode of treatment, it must be

regarded as a special hospital. The building is L-shaped, and stands at the corner of Great Ormond Street and Powis Place, opposite to the Children's Hospital. The main building consists of three houses thrown together and altered, and a new building erected in 1883 in Powis Place containing the nurses' institute. The wards are, for the most part, ordinary rooms, some small amount of through-ventilation being obtained in two cases. The water-closets are, for the most part, not cut off from the wards; in one case, however, a wing containing a water-closet and sink with a separating lobby has been built out, but the lobby has only one window, so that the important part—the very reason for the existence of the lobby—the cross-ventilation, has been omitted.

Various Special Hospitals.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
BRITISH.							
Central London Throat and Ear	17	ft.	ft.	ft.	ft.	ft.	ft.
Golden Square (Throat), London	22	60'00	81'00	10'25	830'25	33'00	—
Female Lock Hospital & Asylum, London	280	5'00	68'40	11'00	752'40	17'32	—
Manchester and Salford Lock and Skin..	60	—	57'36	11'00	630'96	—	—
Glasgow Lock	80	—	—	—	—	—	—
Royal Westminster Ophthalmic	50	—	—	—	—	—	76'00
Royal London Ophthalmic	100	—	58'50	—	—	—	115'00
Royal South London Ophthalmic	40	88'00	118'00	12'00	1,416'00	28'00	143'00
Eye and Ear Infirmary, Liverpool	101	{ 17'50 4'50	74'34	—	—	—	—
Birmingham	55	—	—	—	—	—	—
Newcastle-on-Tyne, New Eye	—	—	—	—	—	—	—
Wolverhampton, New Eye	34	—	99'00	—	—	20'66	1,959'88
Chelsea Hospital for Women	63	—	75'00	12'25	918'75	11'28	85'87
Hospital for Women, Soho Square	66	—	86'89	13'50	1,173'00	—	102'00
Samaritan Free Hospital, London	53	—	121'12	13'00	1,574'56	16'40	—
Hospital for Women, Liverpool	33	—	—	—	—	—	921'21
St. Mary's Hospital, Manchester	5	—	—	—	—	—	—
Hospital for Women, Sheffield	—	—	—	—	—	—	—
St. Peter's Hospital, Covent Garden ..	26	7'50	98'47	—	—	—	—
St. Mark's Hospital, City Road	34	—	92'25	—	—	—	717'00
Homœopathic Hospital, Great Ormond Street	94	6'50	75'21	—	—	—	100'00
FOREIGN.							
Norköpings Town Hospital, Sweden ..	145	{ 10'00 4'00	94'25	—	—	—	—

* Average.

† Coupled beds.





CHAPTER XII.

ARRANGEMENT AND CONSTRUCTION OF POOR-LAW INFIRMARIES.

Supervision of Local Government Board.—Official Instructions.—Differences between the Metropolis and the Provinces.—Cubic Space Committee of 1867.—Recommendations as to Space Allowances, both Artificial and Cubic.—Ventilation.—Accommodation to be provided.—Lewisham Union Infirmary and Dewsbury Union Infirmary described.

THE Poor Law requires that the central authority—at present the Local Government Board—shall signify their approval of the plans for every new poor-law building, or for the alteration of any such existing building, and, inasmuch as the accounts of every poor-law authority have to be audited every half-year by an auditor appointed by the central authority, no expenditure can be legally defrayed in respect of any such new building, or alteration of existing building, or be incurred without the knowledge of the central authority. In the case of extensive structural works, moreover, when the cost is so considerable as to render it desirable that the money should be raised by loan instead of being charged to the current rates, the repayment of such loan being spread over a period of several years and the rates being mortgaged as security for the loan, the central authority have to issue an order under their seal in order to sanction the expenditure and to legalise the loan. Thus the arrangement and construction of poor-law infirmaries can only be carried out with the concurrence of the central authority, and consequently there is rightly a tendency to uniformity in the design of such buildings, and certain standards of quality in general arrangement have to be complied with in order to obtain the approval of the central authority.

With the view of assisting those concerned in such work, the Local Government Board have issued a series of instructions entitled "Points to be attended to in the Construction of Workhouse Buildings," * and amongst these are to be found the usual requirements in regard to poor-law infirmaries. These instructions, however, apply mainly to workhouse buildings belonging to poor-law districts outside the metropolis; for it must be borne in mind that, owing partly to the difficulties resulting from the vast size and population of London, and to the extreme value of land in the metropolis and its neighbourhood, it has been found necessary to make certain legislative enactments for special application in the administration of the poor laws in the metropolis. Amongst those which chiefly influence the arrangements for the accommodation of the indoor poor of the metropolis, as distinguished from that for the indoor poor of the rest of England and Wales, is the Metropolitan Poor Amendment Act, 1869, under which an allowance of fivepence per day may be made out of the Metropolitan Common Poor Fund in respect of each pauper maintained in any workhouse—a poor-law infirmary is a "workhouse" within the meaning of the Act—within the number of paupers which such workhouse is certified by the central authority to hold; and likewise the Local Government Act, 1888, under which a further allowance of fourpence per day may be similarly contributed by the London County Council. These enactments, which largely tend to distribute the cost of the poor more uniformly over the whole area of the metropolis, have not as yet been applied to any districts in the provinces, and hence it has not been found practicable to make the same code of rules as to the details of workhouse arrangement applicable alike to the metropolitan and the extra-metropolitan poor-law buildings, and no instructions have been issued specially for application in the metropolis. The amount of space per bed in the metropolitan poor-law infirmaries has been determined, as nearly as the circumstances of each institution would permit, strictly upon the scale recommended by the Cubic Space Committee of 1867, already referred to, and the following are the amounts prescribed for each class of sick:—

	cubic ft.
Ordinary sick	850
Sick of an unusually offensive character ...	1,200
Lying-in women	1,200
Bed-ridden infirm	700

* Knight & Co., London, 1889.

No recommendation as to day-room space was made by the Committee, and accordingly in metropolitan poor-law infirmaries, day-room space, as such, has not been required to be provided for the classes referred to in the foregoing table. Neither was any recommendation made by the Committee in reference to the amount of floor-space, nor to the proximity of the beds one to another; but, inasmuch as mere cubic space is of little use unless the patients are kept well separated on the floor, it is usual to ignore almost entirely any space that may be provided in wards of excessive height above 12 ft. from the floor-level, and to require about 72 sq. ft. of floor-area, with 6 lineal ft. of wall-space—*i.e.* 6 ft. clear across each bed—for every bed in the wards of a poor-law infirmary in the metropolis. The printed regulations of the Local Government Board are very precise in regard to these matters, so far as provincial workhouse buildings are concerned: thus, day-room space of some sort is required to be provided for every class of inmates, and for the sick the regulations prescribe a minimum of 20 sq. ft. of space for this purpose for each of half the total number of patients for whom beds are provided, in addition to the minimum amount of space prescribed for each bed in the sleeping-wards. The space demanded per bed in these latter wards is set out in the regulations as follows:—

Space per Bed.

Class of Patients.	Wall Space.	Floor Area.	Cubic Space.
	Lineal ft.	Square ft.	Cubic ft.
Ordinary sick	6	60	600
Offensive cases	8	80	960
Lying-in cases... ..	8	80	960
Bed-ridden infirm	5	50	500

It will thus be seen that, although the prescribed space in the sleeping-wards in provincial workhouse infirmaries is rather smaller than that in the sleeping-wards of metropolitan infirmaries, there is actually but little difference when the prescribed amount of day-room space in provincial workhouse infirmaries is taken into account.

In the printed regulations of the Local Government Board already referred to are a number of requirements that are now universally looked for in connection with new hospitals and infirmaries. Amongst these it is prescribed that the building is to be so sub-divided that the patients will be in comparatively small groups rather than in large numbers under any single roof; like-

wise that the several pavilions or blocks of wards shall be so placed relatively one to another that each block shall receive the largest possible amount of sunshine, and have free circulation of air all round it. It is further laid down as indispensable that every ward shall have direct means of through-ventilation by external windows in its opposite sides distributed throughout the entire length of the ward, and the amount of window-surface in a ward is usually provided at the rate of 1 sq. ft. to about every 75 or 80 c. ft. of space in the ward. The separation of the water-closets and slop-sink closets from the wards by a cross-ventilated lobby, and the provision of opposite external windows in the chamber containing these closets, are points upon which much stress is laid, and in recent years it has been usual to require alternative means of ingress and egress to all wards, in order to ensure to the utmost the safety of the patients in the event of fire or panic. Attention is further directed to the need for constant ventilation in the wards apart from the usual means afforded by doors, windows, and fire-places, and the use of air-bricks at the floor level, and also at the ceiling level, of Tobin tubes, of Sherringham ventilators, and the like, is advocated, and the arrangement of the drains so as to ensure their ventilation, to exclude sewer air or cesspool air, to afford facilities for inspecting, flushing, and cleansing them are dealt with in some detail.

The regulations lay down as a general rule that no single infirmary is to be arranged for more than from 500 to 600 patients, since experience has shown that the difficulties of efficient superintendence of such institutions greatly increase with large numbers, and fewer persons can be found who are capable of filling the higher positions in the staff of a large infirmary with efficiency and at the very moderate salaries that boards of guardians are willing to offer than for infirmaries of the smaller kind. Notwithstanding this wholesome general rule, however, there are several instances in the metropolis where poor-law infirmaries have, in recent years, been erected to hold upwards of 700 patients; and even in the provinces some very large work-house infirmaries have been built, notably that for the parish of Birmingham, which, though a considerable part was adapted and not specially built for infirmary purposes, affords accommodation for the excessively large number of 1,665 patients. The size and conditions of so vast an establishment have involved a system of management differing somewhat from that usually adopted at poor-

law separate infirmaries, and accordingly the responsibilities and labour of supervision in the several departments have been subdivided with such considerable success that the system is being tried in one or two other large poor-law infirmaries; but it still remains to be seen whether the permanent management of such large institutions can be carried on satisfactorily and free from that friction and those unfortunate circumstances arising from careless, parsimonious, or neglectful management, which have occurred in certain institutions of the kind.

Lewisham Union Infirmary.—The accompanying plan of the new separate infirmary of the Lewisham Union, erected from designs by Messrs. A. and C. Harston, architects, of London, will serve as a type of the modern poor-law infirmary of the metropolis. Though separate from the workhouse of the union, it adjoins that institution, and stands on a site of 2 acres 2 roods 11 perches. This is a very small area on which to erect such an infirmary, but as it is surrounded on its west and south sides by much open ground, and has a wide high road on its east, there is less objection to the limited extent of site than would otherwise be the case. The buildings afford accommodation for 372 patients, there being twelve main wards containing twenty-eight beds each, five small wards with six beds each, and two others with three beds each. Accommodation is also provided for a staff, consisting of a detached residence for a medical superintendent, two rooms with bath-room &c. for an assistant medical superintendent, two rooms and an office for the matron, two rooms for the assistant matron, and the same for the night superintendent, a room each for six head nurses and six night nurses, and a cubicle each for twelve assistant nurses, together with a mess-room and a recreation room for the joint use of the nurses; two bedrooms and a sitting-room for the cook and laundress, and three bedrooms and mess-room for some half-dozen maid-servants, as well as a gate lodge for a married couple. An office is provided for the steward, and mess-rooms for the laundry women and other subordinate servants, as well as for the engineer, porters, stokers, &c., who are non-resident members of the staff.

The buildings are arranged in four parallel blocks, having their axes approximately north and south. The block nearest to the High Street is assigned to the staff, and behind this, at a distance of some 70 ft., is the infirmary proper, comprising two three-storey pavilions—one for each sex—150 ft. apart, with a one-storey block of administrative offices between them. The latter contains the

offices of the medical superintendent and steward, the dispensary, needle-room, mess-rooms for servants, large kitchen, scullery, larders, pantries, extensive general stores, and laundry building and engineer's department, where, besides a 10-horse-power engine, are two powerful boilers, either of which will suffice for the work, also a steam pump in connection with the hydraulic lifts, &c.

The ward pavilions are of great length—nearly 250 ft.—comprising as they do in each storey two main wards of twenty-eight beds each, in the same line, besides the necessary ward offices and separation wards. Having regard to the large number (186) of patients under the one roof, it would have been better had these pavilions been sub-divided in the middle into two distinct blocks, but as that arrangement would have involved an additional staircase and some increased cost in administration and supervision, the more economical plan of arranging them in continuous double-length pavilions was adopted. The main wards are of the type usual in modern Poor Law infirmaries. They have windows along both sides, the beds being arranged in pairs between the windows. Each ward is 84 ft. long, exclusive of a recess at one end, 24 ft. wide and 12 ft. high; thus each bed has its full amount of cubic space, with 6 ft. of wall space, and 72 sq. ft. of floor area, according to the regulations already referred to. These wards are each warmed by two central stoves of the kind known as "Thermhydric," stoves invented by Mr. Saxon Snell, with double fires and descending smoke flues, and having a series of circulating hot-water pipes on either side of the fires, and air chambers for the admission of fresh warm air into the wards. The windows have double-hung sashes, with an ingeniously designed hopper-shaped ventilator in the head of each window; and in addition to these and the stove ventilators, other ventilators are provided near the floor level and near the ceiling level of the main wards in the ground and first floors, while archimedean screw ventilators are provided in the roof of the second-floor wards. The main wards are provided with balconies 7 ft. wide along their west side, also a convenient external iron staircase with large landings at the outer ends which will afford a valuable adjunct in the event of fire. The arrangement of the central staircase in each pavilion deserves special attention, since it is placed wholly in a projecting turret instead of, as usually placed, within the pavilion itself. This has been done with the view of obviating the objection commonly ascribed to internal staircases, that they, and the lift shafts, serve as air-ducts and tend to convey ward-air, with all

its impurities, from one storey to another. This objection is specially applicable in the case of high buildings, and is even more serious when the building is so large as to hold a considerable number of sick persons. Hence in the present instance the architects have treated the staircase and lift of each pavilion more upon the plan usually adopted with regard to the water-closets of hospital buildings, namely, by placing them in a projection and connecting them with the pavilion in each storey, by means of a cross-ventilated lobby or passage, and, in order to prevent such large projections as are necessary for the purpose from unduly interfering with free movement of air along the sides of the pavilion, the connecting passage in each storey is formed somewhat like a bridge, being only about 7 ft. high, thus leaving a fairly large opening between its roof and the floor of the passage above. Above the staircases are placed the principal water-tank chambers, and these tanks, together with the tanks in the kitchen and laundry building, and the block of officers' apartments, will store about 12,000 gallons. Concrete is largely used in the construction of the building, the stairs and the floors generally being formed of that material, the ward floors being laid with polished oak, and the floors of the corridors, passages, water-closets and bath-rooms, &c. covered with asphalte or tiles. The ward walls are plastered internally.

Dewsbury Union Infirmary.—The new infirmary at the Dewsbury Union Workhouse was erected from the designs of Messrs. Holtom and Fox, architects, of Dewsbury. The building is a good example of a modern workhouse infirmary of a fairly important provincial union. It is situated at the workhouse, and is under the control of the master and matron of the workhouse. Its stores of all descriptions are supplied from the workhouse, and, for the present, at any rate, the workhouse kitchen supplies the food and rations for the patients and staff, and the laundry and washhouse of the workhouse are used for the soiled linen of the infirmary as well as of the workhouse. The infirmary provides accommodation for about 200 patients, of whom ten may be in the lying-in wards, and sixteen in the separation wards for syphilis and itch.

The portion of the site actually assigned to the infirmary measures about 300 ft. by 280 ft., and contains nearly two and a half acres. The buildings comprise a central block containing sundry administrative offices, lying-in wards, nurses' apartments, &c., with a two-storey pavilion at a distance of 60 ft. from each side

of the central block—the one on the right for female patients, and the one on the left for male patients. The pavilions are connected with the central block by means of a covered passage 10 ft. wide, having open arches along its sides, and a central longitudinal screen, some 7 ft. high, along the middle to afford lateral shelter to those using the passage. The roof of these passages is flat and provided with parapet walls to allow of its use in connection with the upper storey of the pavilions and central block, either as a means of communication for officers, or for out-door exercise by the convalescent patients of the upper wards.

Each pavilion contains in each storey a general ward 88 ft. long by 24 ft. wide and 12 ft. high for twenty-eight patients, also a smaller ward 36 ft. long by 24 ft. wide for twelve patients, likewise a special ward 16 ft. by 14 ft. for one or two beds, and another special ward or day-room for patients able to leave the general wards. At the outer end of the larger general wards is a staircase, which serves as an alternative means of exit from the upper storey in case of fire, and also affords a distinct approach to the separation wards for cases of itch and syphilis, which are at the extremity of the pavilions. There is thus ample means for classifying the patients, there being, for each sex, two general wards holding twenty-eight beds each, two general wards holding twelve beds each, two special wards holding one or two patients each, two convalescents' wards, either for sleeping or day-room purposes, and an itch ward for four patients, and a ward for four syphilitic patients.

In the central block are provided on the ground storey a sitting-room, with lavatory, &c. for the nursing staff, a room for the medical officer, with a dispensary, lavatory, &c., attached, also two other rooms intended for patients from the workhouse desiring to see the medical officer. On the one-pair floor is a lying-in ward, 47 ft. by 22 ft., holding eight beds, with bath-room at one end and water-closets projecting out at the other, and two rooms opening out of the ward by large doorways for a patient's bed to be wheeled through, each intended to hold one bed for a woman in labour. There is also, on this floor, a nurse's duty-room with a good pantry and store-closet. On an upper floor, over the lying-in wards, are six good bedrooms for the nurses, together with bath and water-closet accommodation. Space has been left behind the ground storey of the central block where special kitchen offices, &c., could be erected in the event of its being ultimately decided to make the

infirmary more complete and independent of the workhouse proper.

Poor-law Infirmarys.

Name.	Total No. of Beds.	Per Bed.		Height of Wards.	Per Bed.		
		Wall Space.	Floor Space.		Cubic Space.	Window Area.	Site.
Lewisham Union	372	ft. 6'00	ft. 72'00	ft. 12'00	ft. 864'00	ft. —	ft. 300'79
Dewsbury Union	200	6'00	72'00	12'00	864'00	—	544'50





CHAPTER XIII.

SCHOOL SANATORIA.

Need for Isolation Provision for Ordinary Infectious Fevers and for Ophthalmia.—Provision should be in readiness, and should be for at least two Infectious Disorders.—Points to be Considered.—Sanatoria at Rugby School, at King Edward VI. School, Sherborne, and at Blundell's School, Tiverton, described.

THE provision of adequate means of dealing with an outbreak of infectious disease is as important to the well-being of a school as it is to the community at large. Indeed, if the greater proportionate susceptibility of the inmates is taken into consideration, it may safely be said to be far more important.

In the great State-aided or State-supported schools in which the children of destitute or pauper parents and orphans are educated, the provision for isolation may be divided into two classes : first, the ordinary infectious fevers common to childhood of all classes ; and secondly ophthalmia, the scourge of ill-kept schools, and the great difficulty of all schools which receive the ill-nourished and sickly children from the slums of great towns. This latter disease has indeed at times reached so frightful a pitch that more than one-half of the children at a large school have been at the same time afflicted. Such a condition of things must, however, be attributed to overcrowding in the school itself, bad ventilation, want of cleanliness, improper food, and other hygienic defects attaching either to buildings or management, and also in some degree to the inherent danger attending the aggregation of large numbers of children in one establishment.

The isolation provision for ophthalmia need not, however, take

the form of a hospital, but rather of a block of observation or probationary wards where the newly-admitted children can be detained until they can be safely trusted to mix with the others.

The provision of hospital accommodation for infectious fevers is practically regulated by the same requirements, whether the school be a large public school for the sons of the wealthy or an establishment for the care and education of destitute children.

The first and principal object to be kept in view in designing a sanatorium for a school is to provide for the isolation, at once, of initial cases. It is the same in the school as it is in the town, the prompt isolation of the first case often prevents the outbreak of an epidemic.

Next it is of importance to provide for the simultaneous isolation of cases of at least two distinct infectious diseases.

The amount of accommodation that should be provided in a school sanatorium must be in proportion to the total number of pupils in the school, but the proportion is affected by various considerations.

In the excellent notes on the construction of school infirmaries and sanatoria, issued by the Society of Medical Officers of Schools, it is pointed out that while any excessive allowance of isolation provision is to be avoided, the accommodation should be "at least, equal to meeting the probable extent of a full outbreak of epidemic disease." If this obvious condition is not fulfilled, the object of the sanatorium as a protection to the school is defeated.

The same high authority points out that the proportion of sanatorium accommodation to the total number of pupils is affected by the following circumstances : (1) Average age at entrance. "At the present time, for large boarding schools in which the average entrance age lies between thirteen and fourteen years, the proportion of boys *unprotected* by a previous attack of the commoner epidemic diseases appears to be as follows :—

70–80 <i>per cent.</i> are <i>unprotected</i> by a previous attack of Scarlet fever.					
25–29	"	"	"	"	Measles.
About 25	"	"	"	"	German measles.
50–70	"	"	"	"	Mumps.
25–30	"	"	"	"	Whooping-cough." *

It appears, however, that there is a tendency, owing probably to increased knowledge of and attention to the laws of health, for the average age of unprotectedness to rise ; that is to say, that

* *Op. cit.* p. 33.

fewer children are attacked with infectious ailments during their earlier years ; and the effect of this must be to increase the necessity for the provision of isolation accommodation in schools.

2. "The existence or otherwise of the 'house system' in a school exerts a material influence upon the incidence of epidemic illness." The fact of the boys being subdivided into small groups in the various boarding-houses, instead of being congregated in one large house, would appear to be of material assistance in the process of checking or stamping-out an epidemic. Of such importance is this regarded by the Medical Officers of Schools Association, that they consider that in a school where the age at entrance averages thirteen and a half years, the existence of the house system may be taken to lessen the sanatorium accommodation required by a number of beds equal to from 3 to 4 per cent. of the boarders.

3. The proportion of day-boys is a material element in the calculation of sanatorium accommodation. For obviously the chances of introduction of infectious disease into a school from without is much greater if there are a large number of day-boys than if there are none. The effect of a large proportion of day-boys is that outbreaks of infectious fevers occur more frequently than where there are none, and, as a consequence, the number of boys attacked at one time are fewer ; the proportion of unprotected boys being, therefore, smaller than if outbreaks were to occur at greater intervals of time. The proportion of sanatorium provision may, therefore, be reduced in a school with a large number of day-boys, by a number of beds equal to about 2 per cent. of the number of boarders.

The foregoing are the main conditions affecting the calculation of adequate sanatorium provision in large boarding-schools, and are based on the supposition that all infectious diseases are to be provided for. If, however, measles is to be eliminated from the list of diseases treated in the sanatorium, the total accommodation may be reduced from 20 per cent. to 10 per cent. of the total number of boarders.

The form in which the accommodation is to be provided will vary in point of size according to the size of the school, and to the other factors mentioned above ; but otherwise the principles will be the same for the largest as for the smallest schools.

Sanatorium at Rugby School.—The first example of a school sanatorium plan to be given is that at Rugby School, and it is accorded preference because it is one of the earliest (if not the

earliest) attempts to provide suitable isolation accommodation on an intelligent plan. The building consists of three wings radiating from a common centre. At the meeting of the wings is placed the staircase, which is circular on plan. Two of the wings contain each two sick-rooms on each floor; the third contains the matron's rooms and domestic offices on the ground floor, with two sick-rooms on the first floor and bedrooms for staff above. Each sick-room is intended to hold two beds, and in addition to the open fireplace each room is provided with a hot-water coil. The water-closets are placed at the ends of the corridors, and are not sufficiently disconnected from the sick-rooms. The want of a bath-room on the upper floor is an omission which might easily be rectified. The plan, as Dr. Dukes points out,* "can be so varied and modified as to provide ample accommodation for every case of illness in schools of any number. Such a building may have either three or four wings, each of which can be kept entirely separate." It might also with advantage in point of economy of administration be further modified by having in one or two of the wings larger wards, holding from six to eight beds each. Further accommodation for nurses would also seem to be desirable, and also better provision of closet and sink arrangements.

Sanatorium at King Edward VI. School, Sherborne.—

This building was erected in 1887. The complete scheme provides a central building with two wings. At present only one of the wings and the central building have been erected. The central building contains, on the ground floor, the matron's rooms and the kitchen offices. In a basement under part of the latter are the larder, coal-store, and heating apparatus. The upper floor contains two separation wards for one bed each, and a large ward for four beds. The wing is connected with the central building by a covered way, entirely open at the sides. It contains on each floor a large ward for eight beds, a nurse's room, a small pantry, space for portable bath, with a water-closet and sink in a projecting tower at the angle of the ward. Each ward is provided with a hot-water coil in addition to the open fireplace, and each has a large bay-window with a seat running round it.

Sanatorium for Blundell's School, Tiverton.—This building is planned much on the same lines as the one at Sherborne, and here also one wing is deferred for future erection. The centre building is of one storey only, and contains a room for the caretaker,

* *Health at Schools.* Cassell & Co.

kitchen offices, linen-store, and lavatory for medical officer. The wing is of two storeys, and is connected with the central block by a covered way. On each floor is a ward for six beds and a small one-bed ward, a nurse's room, ward scullery, and space for movable bath. The water-closet and slop sink are built out at one angle of the ward. The intention is that for the slighter ailments the wards will be used for the full number of six patients, while for the more serious cases two of the beds will be left vacant. In the former case the cubic space per bed will be about 800 ft., in the latter 1,560 ft. There is a small detached shed for disinfecting purposes.





CHAPTER XIV.

ON THE CONSTRUCTION AND ARRANGEMENT OF MEDICAL SCHOOLS.

HOWEVER closely connected with its hospital a medical school may be, it should have an entirely separate entrance, under the supervision of a porter, who should admit only students and others having business in the school. Close to the entrance should be found a hat and coat room lobby, and this, too, should be so placed as to be under the control of the hall-porter, who can watch those using it, and prevent all others than students entering it for any purpose. The more completely this room is open to inspection the better, and for this purpose panels of glass or of wire network are used. In addition to the accommodation for hats and coats, a number of small cupboards with locks and keys—lockers—in which students can keep books, small instruments, &c., should be provided. The students must themselves be responsible for the safety of any articles placed here, and they should be dissuaded from keeping money and valuable instruments in their lockers. A common-room for students should also be provided; it should not be too large, nor very well furnished, nor in too convenient a situation, certainly not near the door, so that every student must pass it when entering or leaving the school. Good students will spend very little time in the "common-room," and its attractions often prove only too great for those who are inclined to be idle, and for that reason it is not well to have it in so conspicuous a place as to needlessly add to the number of its victims.

Lecture Theatres.—These must be three in number, and may be

more numerous still. One is usually reserved for the lecturer on chemistry, and the other lectures are shared between the other two. They should be constructed in the form of an amphitheatre, and the tiers of seats should rise one above the other by progressively increasing steps. (If the vertical distance between the rows of seats is equal, the students highest up are at an obvious disadvantage.) The seats should be sufficiently broad to be comfortable, and on the back of the one below should be fixed a rest for the note-book. The access to the seats should be easy, with a sufficiency of gangways; this serves to distribute an audience better than anything else. The lecture theatres should not be too large; they should be well lighted, and the lecturer should have proper accommodation for specimens, for diagrams, and for drawing on the black-board. Arrangements should be made for using a lantern and screen, and for darkening the room during such demonstrations.

Class-rooms are required for tutorial classes, for anatomical demonstrations, and for teaching practical surgery. They need not be in the form of amphitheatres. The practical surgery room should be provided with couches and tables on which the models who are used for bandaging and for demonstrating surface markings can lie.

Laboratories.—The chief of these is the dissecting-room. This must be well lighted by an ample skylight, and a good electric lamp over each table. It should be floored by some hard, non-absorbent, and easily cleaned material, and be well-ventilated. The walls also should be capable of being easily cleaned. In connection with it should be the "injection-room," where the "subjects" are prepared for dissection, a prosector's room, a demonstrator's room, and a demonstration class-room. No stranger should ever be admitted to these rooms.

The physiological laboratory should be of ample size, well lighted, and specially adapted for microscopical investigations. Tables where the students themselves mount and prepare specimens must be found, with incubators, sterilisers, and the usual physiological apparatus. Connected with this should be the lecturer's own private laboratory, and those of the demonstrators, and some private rooms in which the more advanced students can work. In this laboratory, or in one built specially for it, bacteriology should be taught, and the apparatus required for its pursuit should be kept constantly fresh. The chemical theatre is generally used for no

other purpose than the teaching of chemistry. Sometimes the students use the theatre for the class of practical chemistry, but a specially constructed room is really far better.

Rooms for pathological histology, pathology, bacteriology, embryology, physics, hygiene, and pharmacology will be needed.

Library.—The library should be thoroughly well stocked with all the newer medical and surgical text-books. The aim should be to make it a help to the students rather than a complete set of medical publications. Every facility must be given for students reading quietly in the library, and for consulting without any delay the books sought for. In some schools, books other than text-books can be taken home, but this plan does not seem to be desirable.

Museum.—Every medical school requires a well-appointed museum, where the students can systematically study. The museum may be in several compartments—one to illustrate human anatomy, another comparative anatomy, a third (the largest of all) pathological anatomy, and a fourth materia medica. In adding to these museums, the curator's aim should be to get a perfect collection of typical and more common physiological and pathological changes, and not a number of very rare specimens which are of interest only to the advanced student, and which may be actually misleading to the others by causing the "rare" to be mistaken for the "common." The museum must be well lighted. A descriptive catalogue of its contents must be accessible to students, and everything must be done to make it a place of study.

Club accommodation.—This should consist of a luncheon-room, where good food should be served at suitable times at a cheap rate. This should not be a drinking-bar, and students should be excluded from it except at stated times. Good lavatories with proper urinals and water-closets must also be provided, and it is desirable to have separate sets of wash-basins and urinals in connection with the dissecting-room, so that students after dissecting can at once go to a lavatory.

In the Hospital.—The out-patient consultation rooms must be large enough to accommodate the students who attend there, and this accommodation must be convenient as well as ample.

In the wards, proper facilities must be given for the clerks and dressers to take and transcribe their notes of the cases, and thoroughly examine urine, sputa, &c. In addition, there should be a special laboratory where more difficult analyses—quantitative—

may be carried out, and where toxicological and bacteriological investigations can be made.

THE LONDON MEDICAL SCHOOLS.

In London the medical schools are with two exceptions attached to, and intimately connected with, hospitals, the exceptions being King's College and University College, which are entirely separate bodies, quite independent of the hospitals which bear their names. Until quite recently all the medical schools, with these two exceptions, were within the premises of the hospitals to which they are attached. At Charing Cross this arrangement does not obtain, since, a few years back, the medical school was moved to a separate site across the street. In none of the London schools will be found such complete and extensive buildings as are to be seen at Edinburgh, Glasgow, or even at Owens College, Manchester; and in most of the schools the plans show very plainly how the buildings have been added to from time to time as opportunity or funds would permit.

At St. Thomas's, one of the newest buildings, the medical school occupies the extreme southern angle of the site, and is all one storey only in height. There are three theatres for anatomy, medicine, and chemistry respectively, a general museum and one for materia medica and chemistry, a dissecting-room, a chemical laboratory, and a physiological class-room.

The school buildings at St. Bartholomew's are more extensive, and the museum and library in particular are very handsome rooms.

At Guy's Hospital the school buildings have recently been enlarged by the acquisition of the land to the north of the inquest-room and mortuary, and the erection thereon of a large dental department and rooms for practical chemistry and physics, but even with this important addition the school will still be divided between two separate buildings quite distinct from each other.

The St. George's Hospital school is hidden away in a corner of the site behind the hospital buildings, and is evidently much cramped for room.

Charing Cross Hospital is fortunate in having a medical school on a site of its own, quite close to, but not connected with, the hospital, except by a subway under Chandos Street. The site is cut in twain by an entrance into Bedford Court, which it would have been to the advantage of everybody to have abolished. For

some unfathomable reason this desirable end was frustrated, and the building suffers in consequence. In the basement is a large students' common-room, lavatories, &c., stores, school-keeper's residence, and the museum. The subway from the hospital enters at this level, and forms the means of communication with the post-mortem room on the top floor, to which bodies are taken by a lift. On the ground floor is the main entrance, porter's lodge, meeting room for staff, secretary's office, library, students' club-room, curator's room, and the upper part of the museum; whilst on the first floor is the chemical laboratory, physiological theatre, laboratories for advanced chemistry, physiology, and physiological research. The dissecting-room, anatomical class-room and theatre, and *materia medica* museum and the post-mortem room are all on the top floor.

The London Hospital also possesses a new and self-contained medical school which is noticeable for its library, a specially noble room, its well-lighted dissecting-rooms, and its museum.

University College is an institution entirely distinct from the hospital, and the medical school is only one of the faculties of the college. The accommodation here is probably the most complete in London.

At the Middlesex Hospital, the buildings devoted to teaching purposes are within the hospital grounds, and are hospital property. They have been added to from time to time, and are, as far as opportunity and funds permit, as complete as they could be made.

The school buildings at St. Mary's are modern and fairly good, but are sadly crippled for want of space.

PROVINCIAL MEDICAL SCHOOLS.

In the provinces, Owens College at Manchester is probably one of the most complete medical schools existent (excepting, of course, Edinburgh). This building contains on the ground floor two theatres, one for anatomy and the other for medicine, general museum, *materia medica* museum, library, students' reading-rooms, with professors' rooms, lavatories, &c. The mezzanine floor is occupied by the upper parts of the two theatres, the two museums, and the library, an anatomical class-room, students' common-room, laboratory of *materia medica*, and a museum of hygiene. The first floor contains the dissecting-room, with injecting-room and demonstrator's room adjoining, microscope room, upper part of general museum, pathological laboratories, surgical and physiological labor-

atories, and a private laboratory of *materia medica*. Part of the building is carried up to form a second storey, in which is a chemical class laboratory, room for analysis, professor's study, students' physiological room, galvanometer room, dark room, and balance-room.

A new college building for the medical faculty of the University of Durham was erected in 1888. It contains an anatomy theatre with seats for 150, a dissecting-room, 70 ft. by 30 ft., with physiological, pathological, and chemical laboratories. This building is to be enlarged at some future time by the addition of a large residential hall for students, and a building for animal pathology.

At Sheffield is a medical school in connection with Firth College. The present building was erected in 1888, and contains *materia medica* class-room, museum, anatomical and physiological departments, and rooms for the local medico-chirurgical society.

The buildings of the medical faculty of University College, Liverpool, have been added to at various times and do not appear to be adequate to present needs. They will probably at no very distant date be rebuilt.

The University of Cambridge possesses very complete and well-appointed medical schools. The chemical department in particular, which was rebuilt in 1888-9, is a very fine building and contains, besides very excellent laboratories, three lecture-rooms, one of which affords accommodation for 250 students.

The range of buildings belonging to the medical school of the University of Edinburgh, which is one of the largest medical schools in Europe, is grouped round two large courtyards, one being called the principal court, the other the anatomical court. A very conspicuous feature in the plan is the graduation hall, a semi-circular building which, with its two galleries and arena, occupies three storeys in height. There are eight separate lecture theatres, one of which, that devoted to anatomy, is larger than the other seven. The ground floor is to a large extent occupied by stores. Here are also the receiving and injecting rooms of the anatomical department, with a detached macerating-house in the centre of the anatomical court, midwifery class-room, museum, and practical room, students' common-rooms, reading-room and library. On the first floor is the anatomical museum, theatre, prosector's room, bone room, and professor's private rooms, the physiology class-room with a microscope gallery and rooms for physiological chemistry and pathology, the chemical lecture-room, with tutorial-

room and practical work-room, and the public health laboratory with balance-room and professor's private rooms. On the second floor is the dissecting-room with a small class-room attached, a class-room for the practice of physic, a class-room for surgery, a practical surgery room, and a surgical museum; materia medica class-room with laboratory, museum, and professor's room and laboratory, pharmacognosy room, students' museum and reading-room; two large laboratories, balance-room, distilling-room, and combustion-room; pathology class-room, and rooms for pathological anatomy and pathological chemistry.

The medical school of Glasgow University occupies the eastern wing of the large range of buildings in which the work of the university is carried on. In the basement is the anatomical lecture theatre, which also extends into the ground floor. Here also are rooms for private work, anatomical and physiological laboratories, surgery class-room, reading-room, and other rooms connected with the anatomical department. The chemical laboratory is also entered on this floor and extends to the ground floor. On the ground floor is the chemical lecture theatre with two museums attached. Class-rooms for medical jurisprudence, physiology and natural history, each with its professor's room attached. On the first floor are class-rooms for midwifery, practice of medicine, materia medica, and surgery.

The medical school of Trinity College, Dublin, was rebuilt in 1887-8. It contains a chemical department, in which is a theatre with seats for 350 students, with laboratories and rooms for general chemical work; an anatomical department with a dissecting-room 108 ft., by 30 ft., with an annexe 30 ft. by 26 ft., macerating-room, rooms for demonstrators, lavatories, &c., an anatomy theatre capable of accommodating an audience of 400 persons, and a bone museum; a surgical theatre, a materia medica theatre, a pathological museum, a museum of comparative anatomy and zoology, and a physiological institute.

FOREIGN MEDICAL SCHOOLS.

We had to abandon our original intention of giving a description of the foreign medical school buildings. An account of the systems of medical teaching in the various countries will be found in Vol. III. The subject of medical school buildings is so large a one that it merits a book to itself. We did, however, endeavour to procure plans of some of the more representative of these buildings,

but were singularly unsuccessful. In the United States, for example, although Dr. Billings co-operated to the fullest extent, it was found that the authorities not only refused the plans, but objected to afford facilities to an architect engaged for the purpose to have access to the buildings and to do the work free of all cost to the authorities. This explanation is due to the reader, although our observation leads us to the conclusion that the ground is, for all practical purposes, sufficiently covered by the plans of medical school buildings which will be found in the portfolio.

[MILITARY HOSPITALS.]

It was our original intention to have given a description of the construction and arrangement of the principal military hospitals of the world in this volume. It was found more convenient to include all particulars concerning military hospitals in Vol. III., together with a description of the plans which will be found in the portfolio. We have accordingly adopted this plan, and must refer the reader to the third volume accordingly.]





APPENDIX.

(A)

CLAYBURY ASYLUM.

THIS descriptive sketch is given to enable the plans contained in Vol. II. to be more readily understood. We forbear criticism, as the buildings are not yet finished, nor can they be fully occupied for about two years to come.

This building, erected at Woodford, in Essex, was commenced by the Middlesex magistrates as a fourth asylum for the old county of Middlesex, but on the passing of the Local Government Act, 1888, the site and foundations then in progress passed to the London County Council.

The site comprises an area of 270 acres, being part of the old Claybury Hall estate, beautifully situated on high ground, 230 feet above the ordnance datum, and commanding an extensive view over the valley of the Thames. Part of the land is charmingly wooded, affording shaded walks for the patients. No better site could be found for such a building, and although only $1\frac{1}{2}$ mile from Woodford Station, and $6\frac{1}{2}$ miles from the Tower Hamlets, from which district it is expected most of the patients will be sent, the asylum will be perfectly secluded, and comprise in its own grounds all the beauties of an English rural district.

The original design was prepared in competition in 1887, when seven architects of experience in asylum planning were invited to submit designs; six were sent in, and the one prepared by Mr. G. T. Hine was selected.

The building is designed to accommodate 2,000 patients, 1,200 females and 800 males, the former occupying the eastern side of the buildings and the latter the western, while the administrative department, the kitchens, stores, laundry-buildings, recreation hall, and chapel, occupy the centre, and are flanked east and west by two central corridors which communicate with the main corridors leading to the wards in such a way as to allow access from either male or female side to all the central buildings and offices without allowing the two sexes to meet.

The asylum is placed on the summit of a hill, from which the ground slopes on all sides ; the nob at the top has been sliced off to form a level plateau twelve acres in extent, on which about two-thirds of the entire buildings are erected at one uniform ground floor level, from which the outer main corridors slope off, generally to the outside blocks ; but these in no case exceed 5 ft. below the ground floor of the main building.

The patients' wards are comprised in thirteen blocks, ten of them arranged outside the main corridor which surrounds the central buildings. Of these blocks six on the male side are planned as follows :—

There are three two-storey blocks on the south front for sick and infirm cases, arranged in six wards of forty patients. Each ward being self-contained on a floor, and comprising two or three day-rooms, two dormitories, and single rooms in the proportion of one to eight patients, with all requisite bath-rooms, ward sculleries, attendants' and store-rooms, lavatories and water-closet annexes, and with separate and distinct approaches to airing courts and to main corridor leading to recreation-hall and chapel. Two of these infirmary wards are designed as reception wards for recent cases.

There is also one large block for acute cases, holding 165 patients, and divided into six wards, three of which hold 30 and three 25 patients each. These wards are planned with a view to the further separation of patients, each with two or three day-rooms and dormitories, and single rooms, in the proportion of one to three patients, all other accessories being as before.

Further north is a group of buildings for 235 working, quiet, and chronic cases, divided into four wards, each comprising a large day-room with two dormitories, a few single rooms and other rooms as before, with the exception of bath-rooms, as these patients will bathe in the general bath-house.

Facing one of the large interior courts is a two-storey block for 160 epileptics, divided into three wards, the day-rooms being on the ground floor and the dormitories above. This arrangement was determined by the Committee, and naturally provoked some opposition from the Lunacy Commissioners, who ultimately allowed it to pass on the condition that an additional observation dormitory on the ground floor should be given.

On the female side the wards are somewhat similarly arranged, there being three blocks of six infirmary wards, each ward holding 48 patients as against 40 on the male side ; an acute cases block for 252 patients divided into nine wards ; a group of wards for quiet working and chronic cases, holding 360 patients : a block of three wards for 180 epileptics ; and an extra ward for 120 laundry patients—thus making up the 1,200 female patients, or 2,000 patients in the whole asylum.

The buildings comprise, in addition to the patients' blocks, large workshops for males, and laundry buildings and large sewing-rooms for female workers ; a general store, a bakery, a large kitchen with ample sculleries and larders, a recreation-hall capable of seating 1,200 people, and a chapel with 800 sittings.

To the east of the chapel is a residence for the medical superintendent,

and on the west is the main entrance block containing board and committee rooms, offices for the staff, and on the first floor sitting and bedrooms for three or four assistant medical officers ; while in a separate building on the north side are rooms for two or three more assistant medical officers.

Flanking the administrative centre are blocks for the attendants and nurses, comprising large mess- and day-rooms, with bedrooms on the first and second floors, and a similar building on the north side gives further accommodation for nurses and female officers, one wing being set apart for night nurses. These three blocks give sleeping accommodation for 108, while in the patients' blocks are private rooms for 120 additional attendants, and it is expected that a further number of married male attendants will reside out of the asylum.

A separate residence on the north side is provided for the steward, and an isolation hospital for twenty patients (not shown on the ground plan) is erected at a little distance from the main building.

The total accommodation of the asylum, including patients, nurses, and attendants, and the medical and other staff, will be about 2,250.

The building is erected north and south, nearly all the day-rooms occupied by patients having more or less a southern aspect. By the oblique arrangement of the outside corridors the front buildings do not interrupt the view from those behind.

The dormitories are planned on hospital principles, all having cross-ventilation, so far as is possible, by opposite windows.

The water-closets throughout are in annexes connected with each ward by a cross-ventilated passage, and contain, in addition, rooms for slop sinks and dirty linen, and on the men's side urinals. The walls of all these annexes, also of lavatories, ward sculleries, and the bath-rooms above the wooden dado, are lined with glazed brickwork, and the floors are paved with granolithic.

The closets are on the short hopper principle, and are separated from each other by wooden partitions 6 ft. high, with low swing doors 15 ins. above floor to allow of observation.

The main corridors and staircases throughout are lined to 4½ ft. and 5 ft. high with glazed brick dados, the walls above being in pointed brickwork colour-washed.

Each block has at least two staircases, allowing means of escape at each extremity of a ward in case of fire.

The day-rooms throughout and the dormitories in the infirmary wards are lined with framed and panelled pitch-pine dados, stained and varnished, the walls above being plastered.

The recreation hall, which, with the stage at one end, measures 150 ft. by 60 ft. and 45 ft. high, is a fine room, roofed in at one span with a circular ceiling with ribs and panels formed in fibrous plaster.

The floor, and wainscoting to a height of 12 ft., are of oak, and a

gallery at one end which is fitted with seats will accommodate about 100 visitors.

The visiting-room adjoins the recreation hall, and can be used as a refreshment or ante-room to the hall on entertainment nights.

The chapel, comprising a nave, aisles, and chancel, with a clerestory to the nave, is faced both internally and externally with red bricks and stone dressings, and will seat 800 people. It is built in a severe type of the Early Decorated style.

The kitchens, bakery, laundries and general stores are of ample dimensions and conveniently arranged for the reception and delivery of goods, and are fitted up with machinery of the best and newest types, the kitchens by J. & F. May, the bakery by Mason, and the laundry buildings by Bradford.

The system of heating and ventilating this building is in itself a work of considerable magnitude, involving very great consideration. The system is one of hot air warmed by batteries of steam-pipes in heating chambers in the basements of the various blocks, the fresh air being conducted to the batteries by underground trunks, and ascending directly from the heating chambers by air-flues built in the walls, one or more flues opening into every habitable room in the building. In addition to the inlet-flues there are extraction-flues of corresponding area conveying vitiated air from each room to air trunks and vertical shafts, with extraction cowls in the roof spaces, coils of steam-pipes being introduced at the base of each extraction shaft so as to create a current.

The architect claims that the advantages of the system he has adopted are—

1. It can be worked from one centre where all the coaling and nearly all the labour is performed.

2. The absence of steam-piping or coils in the wards, which are always liable to become overheated, or to burst and injure the patients or disfigure the walls.

3. The little risk of fire, the furnaces being isolated and confined to one centre.

4. The ready facility for raising or lowering the temperature in any part of the building as required.

5. The non-necessity for engineers or workmen to enter the wards to start, shut off, or repair the apparatus.

The steam for heating the entire building, as well as for driving the laundry machinery and for cooking purposes and hot-water supply, is generated in a series of boilers on the north side of the building. All the main corridors are constructed with subways below for containing steam, water, and other piping. These main subways measure in the aggregate nearly a mile in length, there being another mile of subsidiary subways in the basements of the various blocks.

The entire buildings are being lighted by electricity, a generating plant

being installed nearer the boiler-house, from which a double circuit of mains is carried into every part of the building, half the lights being taken from one and half from the other. Duplicate engines and dynamos are provided, and accumulators, so that the chances of an entire stoppage of light are very remote.

The electric light will also be conveyed to the outlying buildings, viz., the isolation hospital, which is situated some little distance to the north of the main asylum and provides accommodation for 20 patients ; the mortuary, which comprises post-mortem room, laboratory, pathological room and waiting-rooms for visitors, and the Mansion House, which is the old hall of the estate, and is being altered and enlarged as an asylum for 50 male private patients.

The entire cost of all the buildings, including the lodges and private asylum, and also of all machinery and fittings, but not of furnishing, will average nearly 200*l.* a bed. This does not include the cost of the estate or some outside roads, or of some new farm buildings which are about to be erected as additional to those already on the estate.

The best idea of the magnitude of the asylum may be conveyed by stating that the actual buildings, including only the interior courts, cover an area of over twenty acres ; that the main corridors measure about one mile in length ; that eleven miles of underground piping will be required in the sewerage and rain-water systems ; that thirty millions of bricks have been used in the construction of the buildings ; and that the weight of materials required for the superstructure is estimated at about 150,000 tons. All the buildings have been designed with every precaution against fire, the construction of all staircases, corridors, and connecting passages being fireproof, and the whole of the roofs of buildings occupied by patients being cut off from the rooms below by fireproof ceilings. The staircases are arranged to allow of two escapes from each ward, so that should a fire break out in any part of the building it would be impossible for a patient to be cut off from escape. In addition, a special service of water mains for fire, with hydrants, is provided, so as to command every part of the building, both inside and out.

(B.)

ROYAL NATIONAL PENSION FUND FOR NURSES.

WE have made reference to this Fund in the chapter on Nursing, and it may be useful to state that all nurses and hospital officials, whether lay or medical, are eligible to join it. It has been established for the benefit of all workers among the sick in hospitals and asylums and kindred institutions in the British Empire.

Chief Object.

The chief object of the Royal National Pension Fund is to afford to nurses an absolutely safe means of providing, at the lowest possible cost to themselves, an allowance during incapacity for work caused by sickness or accident, and a certain income for their declining years. This object will be carried out by receiving and investing such fixed periodical sums as those who join the Fund can afford, by adding to the pensions all the profits arising from any source, and by supplementing those sums from a Donation Bonus Fund, created and maintained by those interested in nurses and nursing institutions.

Morgan Benevolent Fund.

This Fund was established to afford immediate pecuniary or other relief by loan or absolute gift to matrons, sisters and nurses (if members of the Pension Fund), and to grant annuities in certain cases.

President.

H.R.H. THE PRINCESS OF WALES.

Patron.

H.R.H. THE PRINCE OF WALES.

Patronesses.

THE DUCHESS OF BEAUFORT.
THE COUNTESS OF ZETLAND.
THE COUNTESS CADOGAN.

THE COUNTESS OF STRAFFORD.
THE LADY ROTHSCHILD.

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 ARTHUR H. A. MORTON, Esq., Athenæum Club, Pall Mall, S.W.
 PERCIVAL A. NAIRNE, Esq., Chairman Finance Committee, *Dreadnought*
 Seamen's Hospital.
 G. NORMAN, Esq., Oakley, Bromley, Kent.
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 ALFRED CHARLES DE ROTHSCHILD, Esq. (Messrs. Rothschild & Sons).
 REV. J. H. SLESSOR, Royal Hants County Hospital, Winchester.
 JOHN WATNEY, Esq. (Mercers' Hall, E.C.).
 CLIFFORD WIGRAM, Esq. (Director of Bank of England).

Annuitants' Representatives.

MISS L. M. GORDON, St. Thomas's Hospital.
 MISS E. VINCENT, Lady Superintendent, St. Marylebone Infirmary.
 MRS. G. Q. ROBERTS, Hon. Secretary, Benevolent Fund.
 MISS A. ROSS, Victoria Infirmary, Glasgow.
 MISS C. DAVIDSON, Royal Infirmary, Liverpool.

Honorary Counsel.—HARRY T. EVE, Esq., 4 New Square, W.C.

Honorary Solicitors.—MESSRS. SLAUGHTER & MAY, 18 Austin Friars, E.C.

Honorary Brokers.—MESSRS. GREENWOOD & Co., 28 Austin Friars, E.C.

Bankers.—THE BANK OF ENGLAND.

Auditor.—FREDERICK WHINNEY, F.C.A., 8 Old Jewry, E.C.

Consulting Actuary.—GEORGE KING, F.I.A., F.F.A.

Secretary.—LOUIS H. M. DICK.

Assistant Secretary.—GEO. P. POCOCK.

Offices.—8 KING STREET, CHEAPSIDE, LONDON, E.C.

The managers of the Fund desire to meet to the fullest extent the wishes and views of the committees, superintendents, and other officials so as to promote to the utmost the welfare and benefit of their staff. They would suggest that every committeeman and official, after perusing the following scheme of affiliation, should communicate with the Secretary of the Fund (8 King Street, Cheapside, E.C.), and should procure from him a prospectus and copy of the last Report, so as to make himself familiar with the aims, objects, and present position of the Fund. It has at the present time (January 1893) invested funds to the amount of £130,000; there is a Benevolent Fund, with an income of between £400 and £500 a year, and £10,000 in invested funds; and already nearly three thousand policies have been taken up, and they are being issued at the rate of about fifty per month.

The following is the scheme for federating hospitals and kindred charities with the Royal National Pension Fund for Nurses :—

FEDERATION SCHEME FOR COMMITTEES AND TRUSTEES.

SUGGESTED RULES

For the consideration of the authorities of those hospitals, asylums and kindred institutions who may desire to provide for their nursing staff in accordance with the recommendation of the Committee of the House of Lords on Metropolitan Hospitals, which is as follows :

“The Committee think it very desirable that, where the funds of the hospitals permit, pensions should be provided for nurses, whether by the hospital following the example of the London and Guy’s, by joining the Royal National Pension Fund for Nurses, or by the hospital providing a special pension out of its own funds.”

1. The Committee of the * (hereinafter called “The Committee”) have decided to federate with the Royal National Pension Fund for Nurses (hereinafter called “The Fund”), to enable them to assist the matron, superintendent of nurses, and all sisters, staff nurses, or private nurses of the hospital, under forty years of age, who may desire to join the Fund, by paying one-half of their annual premiums while they remain in the service of the hospital, subject to the rules and conditions that from time to time govern the Fund.

Amount of Pension.

2. The Committee agree that the hospital shall, in its own name or in the name of the Treasurer of the hospital for the time being, take out with the Fund a policy, on the returnable scale, for a pension of £10† on the life of any [matron, sister, or] nurse of this hospital under forty years of age, who in her own name, takes out a policy with the Fund for a pension of not less than £10, making in all a pension of £20 per annum.

Participation in Profits.

3. A pension policy taken out (1) by the nurse, on her own behalf, or (2) by the Committee on the nurse’s behalf if she enters on her pension, will (subject to the rules) participate in the profits of the Society and in the Donation Bonus Fund.

Probationers.

4. Any probationer taking out a pension policy on her own account will have, subject to her own policy being £10 at least, on her appointment to the permanent staff, a policy for an amount similar to the other nurses paid for on her behalf by the Committee.

* Name of Hospital or Institution.

† This £10 is suggested as a minimum sum, but any other amount may be inserted.

Sick Pay.

5. Nurses may enter for pensions at fifty years of age without sick pay, or for pensions at fifty-five or sixty years of age with sick pay. The Committee will pay the premium for sick pay, in addition to half the pension premium, in those cases only where the pension is to commence at sixty* years of age.

Premiums paid only so long as Nurse contributes.

6. The Committee agree to continue to pay premiums on the hospital pension policies and the sick assurance policies only so long as the nurse remains in the service of the hospital.

Mode of Payments.

7. Premiums to be paid monthly or quarterly through the Committee, or their officer appointed for such purpose; a nurse's acceptance of the plan of federation being agreed to as sufficient authority for the deduction from her salary of the premium on her policies.

Nurses over Forty Years of Age.

8. The Committee are prepared to consider what help shall be given to members of the nursing staff over forty years of age with the view of making such arrangements as may seem best in each individual case.

Withdrawal.

9. Nurses withdrawing the premiums paid in under their own policies, while in the service of the hospital or within twelve months after leaving the hospital, will forfeit all right to the policies taken out by the hospital on their behalf.

Assignment to Nurses.

10. After a nurse shall have been in the service of the hospital for† years, whether as probationer, sister, nurse, or otherwise, the benefit of the policy effected by the Committee in her behalf shall, if she has complied with the rules herein laid down, be considered as belonging to her and will, in accordance with the preceding rule, be formally assigned to her when her pension falls due, or otherwise, twelve months after leaving the hospital.

Mode of Assignment.

11. In order to assign the policy to the nominee (*i.e.* the nurse) all that is necessary is that the nominor (*i.e.* the Committee's representative) write on the back thereof "All the interest for pension in the within-written

* By fixing 60 years of age as the limit with sick pay, the best return is secured to Institution and Nurse.

† The number of years' service to be fixed by the Committee in each case. Five and fifteen years have been suggested as a minimum and maximum respectively.

policy is now vested in the nominee, subject to condition 3 on back thereof." This endorsement must be signed and dated by the nominor ; and the nominee must take care to have the policy delivered to her and to register the endorsement with the Fund.

Right of Withdrawal of Premiums withheld.

12. The possession of the hospital policy does *not* give a nurse the right of withdrawing the contributions paid by the Committee. It is a condition of the hospital policy that in case of a nurse's death or withdrawal from the Fund before entering on her pension, the contributions paid by the Committee shall revert to the Hospital Trust Fund and be at the disposal of the Committee, for the time being, for the benefit of the nursing staff.

Policies surrendered belong to Hospital Committee.

13. One of the conditions endorsed on the hospital policy is that in case a nurse forfeits her right to the policy it shall be surrendered to the Pension Fund as trustee, and all premiums which shall have been paid thereunder shall, with interest thereon from the date of deposit, be placed to the credit of the separate Trust Fund of the hospital or institution federating with the Fund, to accumulate at interest and to be disposed of by the Committee of the hospital or institution in accordance with the following regulations of the Society governing such Trust Funds :—

(a) All monies paid into the Fund by any hospital or institution, together with all interest thereon, are to be devoted for the sole benefit of the members of the paid staff of such hospital or institution as the Committee thereof shall, by resolution from time to time, determine.

(b) The benefits referred to in the foregoing rule are to be dispensed through the Fund in accordance with its objects as defined in the memorandum of association. These objects include pensions, sick pay, gratuities, and so forth.

Contributions by Nurse after leaving Hospital and before Assignment.

14. It is understood that should a nurse contribute any premium on behalf of the hospital policy during the twelve months following her leaving the hospital, and still not become entitled to the full benefit of the hospital policy, the Fund will hold such premiums at the nurse's disposal, and will return them to her on demand.

Discretion of Committee as to Assignment.

15. Nevertheless, should a nurse leave the service of the hospital before the expiration of * years, the Committee may, in their absolute discretion, assign the policy to the nurse, or otherwise make such allowance therefrom as in their discretion they shall think fit.

* The number of years' service to be fixed by the Committee in each case. Five years has been suggested as a minimum. (Rule 10.)

Power to alter amount of Contribution.

16. The Committee reserve power to alter the amount of their contributions if in their opinion it should be necessary to do so hereafter.

N.B.—It must be distinctly understood that all officials, other than nurses, employed in the work of any hospital or institution are eligible to join the Royal National Pension Fund individually or on the half-premium principle, though not to participate in the benefits of the Donation Bonus Fund, but only in the profit bonuses. Nurses may take out additional policies on their own account for either pension or sick pay at their option.

LOUIS H. M. DICK, *Secretary.*

Royal National Pension Fund for Nurses,
8 King Street, Cheapside, London, E.C.

TABLE SHOWING THE MONTHLY AND QUARTERLY PREMIUMS REQUIRED
FOR A PENSION OF £10 AT AGES 50 AND 55.

Pension only.

Premium (returnable) for a Pension of £10, payable at 50.			Premium (returnable) for a Pension of £10, payable at 55.		
Age next Birthday.	Monthly Premium.	Quarterly Premium.	Monthly Premium.	Quarterly Premium.	Age next Birthday.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
20	0 6 1	0 18 3	0 4 4	0 13 0	20
21	0 6 5	0 19 3	0 4 6	0 13 6	21
22	0 6 9	1 0 3	0 4 9	0 14 3	22
23	0 7 2	1 1 6	0 4 11	0 14 9	23
24	0 7 7	1 2 9	0 5 2	0 15 6	24
25	0 8 0	1 4 0	0 5 6	0 16 6	25
26	0 8 6	1 5 6	0 5 9	0 17 3	26
27	0 9 0	1 7 0	0 6 0	0 18 0	27
28	0 9 6	1 8 6	0 6 4	0 19 0	28
29	0 10 2	1 10 6	0 6 8	1 0 0	29
30	0 10 10	1 12 6	0 7 1	1 1 3	30
31	0 11 7	1 14 9	0 7 6	1 2 6	31
32	0 12 5	1 17 3	0 8 0	1 4 0	32
33	0 13 4	2 0 0	0 8 6	1 5 6	33
34	0 14 5	2 3 3	0 9 0	1 7 0	34
35	0 15 8	2 7 0	0 9 7	1 8 9	35
36	0 17 0	2 11 0	0 10 4	1 11 0	36
37	0 18 8	2 16 0	0 11 0	1 13 0	37
38	1 0 6	3 1 6	0 11 10	1 15 6	38
39	1 2 8	3 8 0	0 12 10	1 18 6	39
40	1 5 4	3 16 0	0 13 11	2 1 9	40
41	1 8 7	4 5 9	0 15 1	2 5 3	41
42	1 12 8	4 18 0	0 16 6	2 9 6	42
43	1 17 11	5 13 9	0 18 2	2 14 6	43
44	2 4 11	6 14 9	1 0 2	3 0 6	44
45	2 16 4	8 9 0	1 2 6	3 7 6	45
46	3 8 9	10 6 3	1 5 5	3 16 3	46
47	4 12 2	13 16 6	1 9 0	4 7 0	47
48	6 18 11	20 16 9	1 13 8	5 1 0	48
49	13 19 3	41 17 9	1 19 11	5 19 9	49
50	—	—	2 8 7	7 5 9	50

TABLE SHOWING THE MONTHLY AND QUARTERLY PREMIUMS REQUIRED FOR A PENSION OF £10 AT 60, WITH SICK ASSURANCE OF 10s. PER WEEK.

Sick pay and pension.

Premium (returnable) for a Pension of £10, payable at 60.			Premium (not returnable) for Sick Assurance of 10s. a week, to cease at age of 60.		
Age next Birthday.	Monthly Premium.	Quarterly Premium.	Monthly Premium.	Quarterly Premium.	Age next Birthday.
20	£ s. d. 0 3 0	£ s. d. 0 9 0	£ s. d. 0 1 2	£ s. d. 0 3 6	20
21	0 3 1	0 9 3	0 1 2	0 3 6	21
22	0 3 3	0 9 9	0 1 2	0 3 6	22
23	0 3 5	0 10 3	0 1 3	0 3 9	23
24	0 3 7	0 10 9	0 1 3	0 3 9	24
25	0 3 9	0 11 3	0 1 3	0 3 9	25
26	0 3 11	0 11 9	0 1 4	0 4 0	26
27	0 4 1	0 12 3	0 1 4	0 4 0	27
28	0 4 3	0 12 9	0 1 4	0 4 0	28
29	0 4 6	0 13 6	0 1 5	0 4 3	29
30	0 4 9	0 14 3	0 1 5	0 4 3	30
31	0 5 0	0 15 0	0 1 6	0 4 6	31
32	0 5 3	0 15 9	0 1 6	0 4 6	32
33	0 5 6	0 16 6	0 1 6	0 4 6	33
34	0 5 10	0 17 6	0 1 7	0 4 9	34
35	0 6 2	0 18 6	0 1 7	0 4 9	35
36	0 6 6	0 19 6	0 1 8	0 5 0	36
37	0 6 11	1 0 9	0 1 8	0 5 0	37
38	0 7 4	1 2 0	0 1 9	0 5 3	38
39	0 7 10	1 3 6	0 1 10	0 5 6	39
40	0 8 4	1 5 0	0 1 10	0 5 6	40
41	0 8 11	1 6 9	0 1 11	0 5 9	41
42	0 9 7	1 8 9	0 2 0	0 6 0	42
43	0 10 3	1 10 9	0 2 0	0 6 0	43
44	0 11 1	1 13 3	0 2 1	0 6 3	44
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46	0 13 1	1 19 3	0 2 3	0 6 9	46
47	0 14 4	2 3 0	0 2 4	7 0	47
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49	0 17 6	2 12 6	0 2 6	0 7 6	49
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(C.)

THE ITALIAN *OPERE PIE*.

Law No. 6972. On Works of Charity.

(Published in the *Official Gazette* of 22nd July, 1890.)

HUMBERT I.

BY THE GRACE OF GOD AND BY WILL OF THE NATION,
KING OF ITALY.

The Senate and the House of Deputies have approved ;
And We have sanctioned and promulgate what follows :

I.

ON PUBLIC INSTITUTIONS OF BENEFICENCE.

Art. 1.—Those institutions of beneficence which are subject to the present law are the pious foundations and other bodies whose scope is altogether or partly :

- (a) To give assistance to the poor in health or in sickness ;
- (b) To procure education, instruction, a start in some profession, art, or trade, or in other way to better them morally and financially.

The present law does not alter the provisions of the laws which regulate scholastic institutions, or those for the encouragement of saving, and co-operation, or relating to lending.

Art. 2.—Among the institutions of beneficence subject to the present law are not comprised :

- (a) The committees for help and other temporary institutions of benevolence which are supported by the contributions of members or the offerings of outsiders ;
- (b) Private foundations destined to the good of one or more particular families, and not subject to devolution in favour of public beneficence ;
- (c) The societies and associations regulated by the civil law or by commercial law.

The committees and institutions included under sub-head (a) are subject to the supervision of political authorities, in order to prevent abuses of public trust.

Art. 3.—In every district a charity association is organised with powers and duties assigned to it by the present law.

To the charity organisation shall pass the goods destined for the poor, according to Art. 832 of the Civil Code.

II.

ON THE ADMINISTRATORS OF PUBLIC INSTITUTIONS OF BENEFICENCE.

Art. 4.—The public institutions of beneficence are administered by the charity association or by corporate bodies, councils, or other special boards instituted by the deeds of foundation or by regularly approved statutes.

Art. 5.—The charity association is composed of a president and four members in the districts which have a population below 5,000 inhabitants ; of eight members in the districts which have populations of between 5,000 and 50,000 inhabitants ; and of twelve members in the others.

By resolution of the charity association, approved by the committee of the district and by the administrative provincial council, the benefactor or a person designated by him may be admitted as a member of the association itself, having regard to the nature and importance of the gift and to all that concerns the management thereof.

In the same manner the founder or a representative of a benevolent work administered by the charity association may also be admitted, having regard to the nature of the institution and the importance of its property according to the rules prescribed by the deed of foundation.

Art. 6.—The president and the members of the association are elected by the district council in the autumn session ; not more than half of them can belong at the same time to the district council or corporation. The president remains in office for four years, and a fourth of the members is renewed yearly.

Art. 7.—The charity association has to watch over the interests of the poor of the district, and to assume the legal representation before the administrative authorities as well as before judicial authorities.

Art. 8.—The charity association promotes administrative and judicial provision for the assistance and guardianship of orphans and abandoned minors, of the poor blind, and deaf and dumb, assuming temporarily the charge of them in cases of urgency.

Art. 9.—The nominating and renewing the administrators of a public benevolent institution, which is not placed under the charity association, are done according to the terms of the rules of foundation or of the respective statutes.

Art. 10.—The members of the charity association and the administrators of every other public institution who must be elected to the office for a determined space of time, cannot be re-elected more than once without interruption ; except for administrations not pertaining to the charity association, by the explicit disposition of the statutes to the contrary.

Art. 11.—In spite of any rule to the contrary in the statutes or in the deeds of foundation, the following persons cannot be members of the charity association or of any other public beneficent institution :

(a) Those who cannot be electors according to the terms of the pro-

vincial and district law, and those who are not eligible according to Art. 30, letters *a, b, c, d, e, f, g, h*, of the same law ;

(*b*) Those who belong to the prefecture, under-prefecture, or other political authority, or of the provincial administrative body in the province; the clerks in the said offices ; the syndic of the district, and the servants of the district administration ;

(*c*) Those who have been declared by the provincial administrative body not to have fulfilled the obligation of presenting the accounts of the charity association, or of any other beneficent institution, or who are responsible for irregularities through which the accounts could not be approved, and who have not received a final discharge from their management ;

(*d*) Anyone who has a suit pending against the institution or association, or is in debt to it and has delayed repaying such debt.

In cases of popular action being exercised, there is a suit pending when the legal representative of the body has put forth demands or complaints, which in the summing of the case or its merits are wholly or partly contrary to the administrator ;

(*e*) The relations of the treasurer down to the second degree.

The clergy and ministers of worship who, according to Art. 29 of the provincial and communal law, may be members of any charitable institution except the charity association.

They may, however, be members of the committees of help which the associations have instituted, and even of the associations themselves in the special case contemplated in Art. 5.

Art. 12.—The nomination of a married woman as member of the charity association or of any other charitable institution has no effect, if within fifteen days of the publication prescribed (Art. 34) the act of marital authority is not produced by the political authorities of the district ; see also Art. 1743 of the Civil Code.

Art. 13.—The following are liable to a penalty of 50 to 1,000 lire except there be application of penal code, if there be any guilt ;

(1) He who knowing of a cause of disqualification under Art. 11 assumes office ;

(2) He who continues to exercise the office when his disqualification has arisen or become known to him ; by fulfilling acts which are not of mere preservation or strict necessity ; or wittingly delaying consignments.

But if the person deny or question the disqualification ; or if this disqualification be a subject of discussion or of examination on the part of the association, of the electors or of the administrative council which was to consider the matter, the penalty is not incurred, even though after deliberation or by provision of the office the disqualification be confirmed by the superior authorities.

Art. 14.—Members of the same family cannot at the same time

belong to the same administration, the brothers, sisters, husband and wife, fathers-in-law and the son-in-law or daughter-in-law.

However, in the case of administrations other than the charity association, there are statutes providing differently.

Art. 15.—A member of the charity association or of the administration of any other work of charity cannot take a part in discussions or deliberations, nor share in acts regarding his interests or those of his relations up to the fourth degree, or the interests of businesses administered by him or of corporations he may represent, or of persons with whom he may be connected in partnership in a collective name as sleeping partner, or sharer of some profit in association or participation.

He further may not compete directly or indirectly or through a third party in contracts of purchase and sale, location, exaction, or public contract with the association or with the public institution to which he is attached ; unless it be that in cases of locations or purchases and sales at the public auctions and by deliberation of the provincial administrative body he has for some reason been admitted to compete.

Art. 16.—The preceding article must also be applied to those who are members of the prefecture, under-prefecture, or any other political authority, or of the administrative provincial body ; and to the syndic of the district.

Art. 17.—Those who break Arts. 15 and 16 incur a penalty of 50 to 1,000 lire, lose their office of administrators of the charity association or of administrators of any other institution, and must make good the losses ; besides being subject to greater penalties if any crime has been committed.

The administration has the right of dissolving the contract.

If it does not proclaim or deduce the nullity, it may have this done by political authority.

III.

ON THE ADMINISTRATION AND ACCOUNTS.

Art. 18.—The administrations of public works of charity must keep an exact inventory of all movable and immovable goods, and a statement of the rights, credits, burdens, and obligations with their relative titles.

Art. 19.—The inventory and its successive adjuncts and variations are communicated to the syndic and the provincial administrative body in the terms and forms established by the regulations.

Art. 20.—The administrations of public institutions of charity must annually make up, in the terms and manner which shall be fixed by rule, the ledger and the current account, together with the treasurer's account and a statement of the result of their management.

Art. 21.—If the treasurers do not present the account within the month, the provincial body shall have it drawn up at their expense.

The administrations of public charitable works must take the accounts into consideration within two months from the day on which they were

presented. If this consideration does not take place within the prescribed period, the examination of accounts falls directly to the provincial administrative body. That body must pronounce itself on the accounts within three months from the day on which they were submitted to them.

Art. 22.—Charity associations and other public charitable institutions may, with the authorisation of the administrative body, taking into account their nature and the importance of their income, have one or more special collectors and one special treasurer or cashier. Otherwise the collecting of the income falls to the district collector, and he by right also acts as treasurer.

The treasurers must provide a security, as established by rule.

Art. 23.—The sums exceeding ordinary wants must be deposited at interest in the Post Office Savings Bank or some other banks for savings or credit named by the directors of the charitable institution with the approbation of the provincial body. Articles 4 and 6 of the Law of 26th May, 1875, No. 2779 (series 3A) are not applicable to deposits in Post Office banks.

Art. 24.—The incomes of public charitable foundations are collected according to the ways existing for the collection of district revenue.

This provision does not apply to the collecting during life of the benefactor, or to the offerings and voluntary subscriptions for charitable purposes, which are regulated by laws concerning the execution of civil duties.

Art. 25.—Public charitable institutions are admitted to the right of gratuitous law proceedings when there is in their favour the condition referred to in No. 2, Art. 9 of the royal decree 6th Dec. 1865, No. 2,627.

With the authorisation of the provincial administrative body another advocate may be added to the official defending.

Art. 26.—Transfers, leases and other similar contracts, and contracts for works of more than 500 lire in value, are to be made by public auction under pain of nullity, and in accordance with the forms prescribed for contracts and works of state.

The provincial administrative body may consent to sales by auction or private treaty.

Art. 27.—The real estate of public charitable institutions must by rule be leased out according to the forms established by regulations.

For lands, the crops and local habits must be duly considered.

Art. 28.—The sums to be invested must be put in the state loan or in securities issued or guaranteed by the state.

If bonds are payable to bearer, they must be deposited in the manner determined according to each case by the administrative provincial council.

The said sums may, however, by consent of council, be employed for the improvement of the existing estate in cases where the greater utility of so employing them is evident.

Art. 29.—When, through neglect of forms established by law, by statutes

and regulations for the guardianship of the estate of a beneficent institution, the administrators have by fraud or grave fault, although there may be no term of transgression, caused a financial injury to the institution, the provincial body officially, or by demand of the prefect, will proceed by administrative means to ascertain the damage, indicating which of the directors appears responsible for it, and to what amount.

The deliberations of the provincial council do not prejudice the accounts of the institution or its administrators, but serve as a claim for demanding from judicial authorities protective precautions.

Art. 30.—Causes connected with the administrative management of public institutions of charity can be tried in the ordinary court.

Causes against the administrators must be tried by the provincial administrative body in the first degree, in the Chancery Court in Appeal, as regards the examination of and pronouncing on the accounts :

(a) When the administrators have ordered expenses or contracted engagements without legal authority ;

(b) When without legal authority they have taken upon themselves the management of moneys or values of the institution.

Art. 31.—The charity associations and public charitable institutions which, owing to the character and importance of their incomes and the kind of beneficence for which they are instituted require the work of paid servants, must formulate their organic plan and fix by special regulation their rights and attributes.

Except in the cases coming within the first part of this article, the charitable associations and public institutions of beneficence may use for the administration confided to them the halls and rooms and the work of the district servants or of the servants of other public charities.

In cases of difference the provincial administrative body decides if and with what conditions the like rights may be exercised.

Art. 32.—The king's government shall see that the following provisions are applied to charitable institutions whenever the composition of their administrative council and their administration should demand the application, except where private statutes have established equivalent or greater securities :—

1. The deliberation of the association and of representatives of public charitable institutions shall take place with no less than one half plus one of the members composing it, and by the absolute majority of all present.

2. The official report of the meetings must be written out by the secretary, and, in the case of the institutions which have no servants, by one of the administrators named at the beginning of the year. The reports must be signed by all those who have met. If anyone present leaves or refuses to sign, the fact must be mentioned.

3. Administrators who without valid reason are absent for three months from the meetings lose their office. The dismissal is to be pronounced by the respective councils and the prefect may move it.

4. An order of payment does not constitute a legal right of discharge for the treasurer if it is not furnished with the signature of the president and of the member who superintends the service to which the order refers, or, in his default, of some elder member.

5. When at the head of charitable institutions there are no permanent paid administrators, but the institutions demand the work of several clerks, every declaration, provision, contract, and in fact, every act emanating from the institution, must have, besides the signature of whoever represents the body, the signature of the head clerk of the office named in the statutes. He will share the responsibility with the administrators in those acts and according to the limits established by the statutes themselves.

Art. 33.—The king's government will provide for the matters contained in the preceding article :

- (a) For the new institutions, in the act of approval of their statutes ;
- (b) For the institutions whose statutes are by the terms of the present law placed under an obligatory revision, in the provisions to be taken in consequence of said revision ;
- (c) For all other institutions, in the manner and terms which shall be established in the transitory provisions for the execution of the present law.

Art. 34.—The deliberations of public charitable administrations for which the approval of the provincial administrative body is required, and those concerning the nomination, election, and re-election of the administrators, are published by copy within a week of their date, like the deliberations of district councils.

Within the same term shall be remitted to the political authority of the district a copy of the reports of the meetings mentioned in the first part of this article.

IV.

ON GUARDIANSHIP.

Art. 35.—Public charitable institutions are placed under the guardianship of the provincial administrative body.

Art. 36.—The following are subject to the approval of the provincial administrative body:

- (a) The ledgers ;
- (b) The running account of the administrators and the accounts of treasurers and collectors ;
- (c) The contracts of acquisition or alienation of landed property and the acceptance or refusal of gifts and legacies ; save as provided for by the law of the 5th of June, 1850, relative to the capacity for acquiring conferred on corporations ;
- (d) Locations and leaseholds for a longer term than nine years ;
- (e) The deliberations which affect alteration or diminution of the estate ;
- (f) The deliberations which establish or modify the organic plans of

the employés, the retirement with pension, and the liquidations of the pensions ;

(g) The deliberations relative to the services of collection and treasury, and the warranties given by collectors and treasurers.

(h) The deliberations to be in court, excepting for preserving provisions in cases of urgency, and save in these cases the obligation of immediately asking for approval.

Whenever legacies or gifts are movable goods not worth more than 5,000 lire, the authorisation referred to in the law of the 5th June, 1850, pertains to the prefect.

Art. 37.—Whenever the administrative body has not approved the ledgers before the new administration begins, for that part not approved will be applied the last ledger approved.

Art. 38.—In the balance no capital sums can be turned from one heading or agreement to another without the authorisation of the provincial administrative body.

Art. 39.—The provincial administrative body on the occasion of revision of the ledgers must see that public charitable institutions reduce their expenses of administration and service to what is necessary.

Whenever a modification of the statutes for this purpose would be needful it will invite the administrations to propose it.

Art. 40.—The provincial administrative body, before deliberating on the acts subject to approval, may order, at the expense of the institution, those verifications which it considers necessary for its audit.

Art. 41.—A summary of the deliberations of the provincial administrative body in the matter of guardianship must be published in the schedule of the prefecture.

Art. 42.—Unless it be within the competence of the court, as regards the deliberations of the administrative body under Art. 36 (b), in the matter of the administrators' running accounts or the accounts of the treasurers or collectors, appeal to the Chancery Court is admitted.

As regards any other deliberation of the administrative body appeal is admitted to the king, save always where the appeal was not presented in the administrative meeting in a litigious manner to the Council of State for incompetence, excess of power, and violation of the law according to Art. 24, law 2, June 1889 ; and where it be for deliberations of going to court, except, however, the extension of appeal to substance, on the terms of Art. 25 of the same law.

Art. 43.—When a charitable institution is supported by help from the State, the attributions pertaining to the administrative body are exercised by the Minister of the Interior in accordance with the competent minister of the department ; and against the minister's decrees appeal is admitted on the terms of the preceding article.

The Minister of the Interior may delegate these functions to the prefects.

V.

ON GOVERNMENT SUPERVISION AND INTERFERENCE.

Art. 44.—The Minister of the Interior has the supreme supervision of public charity. He supervises the regular proceeding of the institutions, examines the conditions of them in administrative reports in relation to their objects, and secures the observance of the present law, of the deeds of foundation, of the statutes and regulations.

For every province a councillor of the prefecture named by the prefect has the special charge of watching over the observance of the laws for public beneficence.

Art. 45.—Whenever the provincial administrative body or the administrations do not comply with *Art. 39*, the prefect shall make to the Minister of the Interior the proposals he may think necessary.

Art. 46.—Except for the faculty of giving, according to law, the precautions and provisions of urgent necessity to guard the interests of charitable institutions, when an administration after having being invited thereto will not conform to the law or to the statutes and regulations of the institution confided to it, or prejudices the interests of the same, it may be dissolved by royal decree, the opinion of the provincial body and the Council of State having previously been obtained.

Art. 47.—If the dissolved administration be the charity association, the temporary management falls by right to the municipal corporation, who may delegate it to one or more of its members.

Within two months after the date of dissolution, the district council must name the new association.

If this new association be dissolved for the same reasons as the preceding one, with the decree of dissolution a commissary shall be named, who shall have the duty of the management for not more than three months.

The indemnity of the commissary is payable by the district, unless it may fall on those it belongs to.

Art. 48.—When a charitable institution interests several provinces and districts, there may, in the cases contemplated by *Art. 46*, having heard the provincial administrative bodies and the Council of State, be named by royal decree, a commissary who assumes its temporary management ; for not more than six months, if the institution affects one single province or districts of one province ; for not more than one year, if it affects several provinces or districts of several provinces.

The indemnity for the commissary is a charge on the institution unless it may fall on the proper party.

Art. 49.—In the event of the dissolution of any other public charitable institution, the temporary management comes by right to the charity association until the usual administration be reconstituted, the said reconstruction to take place within six months.

Art. 50.—When the administration of a public institution of charity, in spite of warnings of superior authorities, will not fulfil an act become obligatory by law or regulation, political authority may order its execution by a special delegate.

For the reimbursement of expenses and every other charge which may be owing by the administrators and the employés provision is made by Arts. 29 and 30.

Art. 51.—The foundation of new public charitable institutions with their own administration can only be made by royal decree, with the previous concurrence of the district council and the provincial council if it concern several districts or the entire province, and of the Council of State.

In the demand or proposal of foundation must be indicated with what means will be fulfilled the aims, keeping in view the possible development of the institution in the future. The appeal against the act which authorises or refuses the foundation of public charitable institutions or the acceptance of legacies or gifts, extends to the substance according to Art. 25 of law 2, June 1889, No. 6166 (series 3rd).

Art. 52.—The deliberations and provisions of the institutions shall be annulled by political authority if they contain violations of laws or of general regulations, or of special statutes having force by law.

And the following rules must be observed :

(a) Besides the copies which according to Art. 34 must at the expense and care of the institution be communicated to the political authority of the district, a copy of every other deliberation and every act which it may demand must also be supplied.

(b) If the political authority of the district shall find that the deliberation or provision contain some fault of the kind indicated in the first part of this article, it shall give notice of the fact to the administration affected within a fortnight of the receipt of the communication, which may then present its observations in answer. In the meanwhile, if the deliberation or decision has not been executed, the political authority shall order that its execution be suspended.

(c) The annulling of the deliberation or the decision will be pronounced by the prefect, after hearing the council of prefecture, within thirty days from the receipt of the copies referred to under rule (a).

(d) The term referred to in the last rule (c) having elapsed without the nullity having been pronounced, the decree of suspension also will be void, and the suppression can no longer be pronounced by the prefect.

It is understood that the powers for providing are always reserved according to the terms of Arts. 40 and 50.

Those deliberations and decisions taken in unlawful meetings and for objects foreign to the functions of the councils and representations of charitable institutions, remain equally void of right, also, if the requirements of the laws have been violated.

The like nullity, if the periods mentioned above have been allowed to

elapse, shall be pronounced, after appeal by parties interested or in office, by a royal decree, after the State Council have been heard.

Art. 53.—The prefects on their own initiative or on request of the district authority, may order at any time the inspection of the offices and administrative acts of the charity association and of other public institutions of charity, and the verification of the funds in the hands of the treasurer.

The political authority of the district may, under the same conditions, order the examination of the treasurer accounts, &c.

VI.

ON REFORMS IN THE ADMINISTRATION AND CHANGES IN THE OBJECTS.

Art. 54.—Almsgiving institutions are concentrated in the charity association. The funds of other institutions destined for alms, except those which serve to integrate or complete some other form of charity exercised by an institution not comprised in this concentration, must be administered by the charity association.

Art. 55.—On the occasion of the concentration referred to in the preceding Article, the revision of the statutes and regulations of almsgiving institutions shall be proceeded with, with the object of co-ordinating the distribution of the income intended for alms, preferably to any one of the following aims, which approaches nearest to the nature of the institution and the intention of the founder :—

(a) To help to support, in the shelters for paupers, or in other equivalent institutions, individuals unable to work, deprived of means of subsistence or of relations obliged by law to administer them food ;

(b) Succour and guardianship of abandoned children, to promote their education and instruction and to start them in an art or trade ;

(c) Subsidies for nursing, naturally or artificially ;

(d) Subsidies for children and adolescents in general, to encourage moral and intellectual education, to help their physical development or to prevent their physical wasting ;

(e) Help and assistance of the poor sick in their homes ;

(f) Temporary help also to able-bodied individuals, when the necessity for relief is manifest, owing to extraordinary conditions or passing illness ;

(g) Help for the foundation and improvement of institutions providing for the safe keeping of the savings of the poor.

Art. 56.—Besides these functions there are generally concentrated in the charity association :

(a) Public charity institutions existing in the district, and having a net income of not more than 5,000 lire ;

(b) The public charitable institutions of any kind for the good of the

inhabitants of one or more districts, whose aggregate population does not exceed 10,000 ;

(c) The public institutions of beneficence existing in the district, the representation of which has suddenly failed, and those for which no administration may be constituted for want of provision in the act of foundation.

If institutions in favour of the inhabitants of several districts are concerned, the concentration takes place with the charity association of the district in which the institution has its principal seat.

Art. 57.—In order to render the administration more simple and economical, to facilitate the supervision and to render the charity more efficacious, any other institution existing in the district may be centred in the charity association, unless its concentration be ordered according to the preceding article.

Art. 58.—When the concentration contemplated in Arts. 56 and 59 does not take place, the public institutions of benevolence may be united into groups, dependent on one or more administrations according to the affinities of their respective aims.

Art. 59.—The following cannot be centred in the association, but may be united into groups according to Art. 58 :

(a) The charitable institutions of every kind for nurslings and for the bringing up of children from babyhood ;

(b) Homes and other institutions for childhood ;

(c) The hospitals and madhouses founded for the benefit of one or more districts, which in the aggregate have not less than 5,000 inhabitants ;

(d) The charitable institutions, with or without board, for instruction and education, whether in health or in sickness ; those destined as a shelter for spinsters, widows, or persons incapable through their social position or their advanced years of procuring themselves a livelihood ;

(e) Reformatories, and houses for care or correction ;

(f) Every kind of charitable institution supported principally by voluntary subscriptions, and offerings, and other irregular income.

But those institutions, which at the date of publication of the present law are administered by the charity association, shall continue to be administered by it, except in the cases of administrative convenience mentioned in Art. 57, which may demand the separation of the institutions from the charity association or the grouping of them together as in Art. 58.

Art. 60.—Those institutions which are also almsgiving, and which owing to the importance of their estates, their nature and the special conditions under which they exercise charity, demand a separate administration, may be excepted from concentration or from being united into groups as ordered in Art. 54 and following articles.

But where almsgiving institutions are concerned, the obligation remains to proceed to the revision of the statutes and regulations according to the rules established in Art. 55.

Art. 61.—Public charitable institutions centred in the charity associations, or collected into groups according to the preceding Article, keep their separate estates, and continue to dispose of their incomes, according to the respective statutes, for the advantage of the inhabitants of the provinces or districts or fractions of districts for the benefit of which they were destined ; and this separation or special disposal must be made clear in the inventories, ledgers and accounts.

But with the authorisation of the provincial administrative body, the existing institutions in one province may unite to dispense in common their respective charities, by the foundation of shelters for mendicity (workhouses), hospitals, reformatories and other institutions of a similar kind.

Art. 62.—The application of the preceding rules is made by royal decree with the previous advice of the Council of State on the proposal of —

(a) The institution affected, the charity association, the district administrative body if the institution concerns one district alone ;

(b) The respective administrations or associations and the respective district councils, with the approval of the provincial administrative body if the institution affect several districts ;

(c) The provincial administrative body if the institution affect the entire province or more than the third of the districts composing the province.

The provincial administrative body shall give on all these said proposals the reason for its advice.

When an institution is meant for the good of those belonging to districts and provinces in which it is not situated, the proposals and advice belong to the bodies and authorities of provinces and districts interested therein ; and according to the nature of the reforms which shall be worked, the seat of the administration may be continued in the same place or transferred elsewhere.

Art. 63.—When the administrations interested or the charity associations or the district or provincial council do not take the initiative in proposing reforms, or do not conform to the prescriptions concerning the revision of statutes, according to preceding articles, or the provincial administrative body delay in issuing its advice, the prefect shall give each one of these bodies a term of from one to three months.

This term being passed, after an account given by the prefect, and the Council of State being heard, provision shall be made by royal decree.

Art. 64.—Excepting subsidies given for education and instruction, or to start an individual in a profession, art or trade, the charity association is forbidden to allow from its funds or from those of the institutions under its supervision, life pensions, or continued pensions, or periodical help to persons in health.

Art. 65.—Every other reform, organic or administrative, not comprised in Arts. 54, 55, 56, 57, 58, 59, and 60, belongs to the initiative of the

administration, the district council, or provincial council, according to the distinctions set out in Art. 62.

Art. 66.—When the district and provincial bodies or the administrations of public charitable institutions neglect to initiate the reforms mentioned in the preceding article, the proposals shall be made by the prefect.

Art. 67.—The proposals for reform indicated in the two preceding Articles shall be put in force by royal decree, after the provincial administrative body and the Council of State shall have been heard.

Art. 68.—Every proposal which aims at uniting or concentrating different charitable institutions, must be published according to Art. 34 and inserted in the schedule of the prefecture if it concern the inhabitants of the whole province or of several districts.

Within thirty days after publication, those interested may lay before the prefect their observations and objections. The administration or the authority which has made the proposal must give an opinion as well as the provincial administrative body.

Art. 69.—The proposals formulated in office by the prefect according to Arts. 63 and 66, and the modifications which the minister intends to apply to the proposals of local authorities, must first of all be placed under the scrutiny of the State Council for its opinion, and must always be communicated to the administration affected, to the provincial administrative bodies, as well as to the syndics and presidents of provincial deputations interested according to Art. 62.

Public notice of the communication must be given in the ways established by regulation ; and the said proposals shall be kept in the respective secretaries' offices at the disposal of anyone who may wish to look through them, for a whole month after date of receipt.

Within that period individuals or bodies interested may present their observations to the Minister of the Interior, who must transmit them to the State Council with a request for an expression of opinion.

Art. 70.—The institutions contemplated in the present law, the aim of which is failing, or which no longer answer for any public good, or which have become superfluous, because in some other way there has been ample provision made and firmly established, are subject to transformation.

The transformation must be such that, deviating as little as possible from the idea of the founders, it should respond to an actual and durable reform of the public charity in the provinces, districts or fractions of districts for which the institution transformed was intended ; observe according to different cases Arts. 57, 58, 59, 60, and 61.

When almsgiving institutions shall be transformed, the rules established in Art. 55 shall be observed.

Art. 71.—For the like transformations the rules established in Arts. 62, 63, 68, and 69 shall be followed.

In case of omission or delay in proposing or deliberating, the prefect shall provide according to Art. 63.

VII.

ON DOMICILE FOR RELIEF (WORKHOUSE, ALMSHOUSE).

Art. 72.—In cases in which right to assistance or help by the charity associations, or by other institutions in a district, depends on the condition of domicile, this condition is considered to be fulfilled when the pauper comes within one of the following classes, arranged here in the order of their importance :

1. That he has lived five years in the district, without notable interruptions ;
2. That he was born in the district, irrespectively of legitimacy of birth ;
3. Or, that being a citizen born abroad, he has, according to the terms of the civil law, domicile in the district.

The domicile for relief once acquired according to the first of the above classes, can only be lost by being acquired in another district.

Art. 73.—The married woman, and the legitimate children, or those recognised by law, under fifteen years of age, have the domicile of the husband or of the father.

The domicile for relief of children over fifteen years of age, and the domicile of the married woman, who for more than five years and for any reason whatever may have habitually lived in a different district from that of her husband, are determined independently of the legal domicile of the husband or the father.

Art. 74.—The time spent under arms, or in establishments for cures, is not considered to constitute an interruption of domicile ; nor may a right of domicile be acquired in a district by spending a period under arms in it, or in cure establishments, or in public beneficent establishments at the expense of the district, or in establishments of punishment or in houses of correction.

Art. 75.—The rules established in the preceding articles are applicable in all cases in which districts, provinces, and other local institutions are bound to reimburse expenses of relief, assistance, and hospital treatment.

Making an exception in the case of institutions which provide obligatory charity by law, there remain the provisions of particular statutes governing the domicile for relief in a different manner.

Art. 76.—If the charity association or other public charitable institution possess the necessary means, they may not refuse urgent help, under pretext that the pauper does not belong to the district, according to the preceding articles.

Art. 77.—Hospitals have a right to be reimbursed by the national government for the care of strangers, which in order to secure repayment by foreign governments, must be provided according to international conventions.

VIII.

GENERAL PROVISIONS.

Art. 78.—The institutions contemplated by the present law exercise charity towards those who have a right to it, without distinction of religious creed or political opinions ; except those institutions which from their essence and by the explicit disposal of the statutes are destined for the benefit of those professing a special creed.

The obligation to help in cases of urgency remains, however.

The administrator of a public charitable institution who, in violation of the provisions in the first and third parts of the present article, gives the whole or a part of the assistance or relief in respect of acts, practices, or declarations which in any way or sense concern religion, politics, or the exercise of political or administrative rights, is deprived of his office and is punished by a penalty of from 50 to 500 lire.

The employé or person attached in any quality to a public charitable institution, who acts as in the preceding paragraph, may be suspended ; and in case of a repetition of the irregularity may be altogether dismissed from the service.

Art. 79.—When the hospitals or other institutions having wholly or partly the aim of sheltering or curing the sick and wounded, refuse to give urgent help, the party interested or the sanitary officer may apply to the syndic. He, having verified the urgency, and gathered information as to the reason of refusal, shall give in writing the orders he judges opportune, and which shall be at once carried out, reserving any definite provision and any other right of the parties interested.

The political authority may use the same right, directly or in consequence of a claim against the provision of the syndic or on his refusal to provide.

The provisions of the present article are also applicable to the case in which hospitals or other institutions of shelter refuse to take in a woman who is homeless and on the point of delivery.

Art. 80.—The controversies between provinces and districts and charitable institutions, relative to the reimbursement of hospital expenses, or relief, assistance or support, which are obligatory on terms of right and special provision of the existing laws, are decided by the administration—

(a) by a meeting of a provincial administrative body if between institutions or districts of the same province, or if between the institutions, the districts and the province ;

(b) by a ministerial decree, with the assent of the State Council, it between different provinces or charitable institutions of districts of different provinces.

These provisions shall be at once carried out.

Within six months of the notification of the order, recourse may be had to judicial authority, if the controversy belong to the competency of common

law, and, if not within the competency of common law, the appeal to the Council of State is reserved in the ways and terms established by the law of 2nd June, 1889.

To impugn or sustain by law the deliberations mentioned at (a), the authorisation for being in judgment is not necessary.

Art. 81.—The representatives of public institutes of charity, or components of them if they be dissolved, or those who by voluntary contributions help to support them, or any other person interested in them, may provide against the definite Government provision if they have not appealed to the king at an administrative sitting, by appealing to the fourth section of the State Council for incompetence, excess of power, or violation of law according to *Art. 24* of the law 2nd June, 1889.

By the decision of the majority of the provincial administrative body for the institutes of the whole province, or more than the third of the districts of the entire province or the district council for the institutes for the benefit of its inhabitants or of a part of it, may also appeal according to the rule, and for the effect spoken of in the first part of this article.

Where definite provisions for ordering and concentrating, grouping, or transforming the institutions or the revision of their statutes is concerned, the recourse or appeal to the fourth section of the Council of State may also be extended to the substance according to *Article 25* of the same law.

The fact of an appeal being directed against the definite finding which has ordered the concentration, grouping, or transformation of the institutions or the revision of their statutes and regulations has the effect of suspending the carrying out of the proposal; but the periods relating to the production and discussion of the appeal are reduced by a half.

Art. 82.—Excepting the provisions of the law of 20th March, 1865, No. 2248, and of the other laws regulating administrative and judicial competency, every citizen who may belong even by the terms of the present law to the province, district or part thereof to which the charity extends, may exercise judicial action in the interest of the institution or of the poor for whose benefit it is destined—

(a) With its representatives or in their behalf and place, in order to make the rights pertaining to the institution or the poor prevail against a third party;

(b) Against the representatives and administrators of the institution to make the same rights prevail, but limits however to the following objects:—

1. To have the nullity of a nomination, or of a dismissal from office declared, in the cases provided by law, independently of any hurtful criminal accusation.

2. To have their obligations liquidated or to obtain the fulfilment of them on condition that the like obligations have been at least in kind declared by judgment, or in any of the provisions of *Arts. 29* and *30*.

3. To constitute them defendants in a court of law, and to obtain the paying of indemnity for right.

Art. 83.—The popular case, whoever the competent judge may be, must be pleaded by the ministerial attorney and always be defended by the prefect and the legitimate representative of the body in question, and cannot be introduced if not on questions which have been subject of appeal notified to the prefect thirty days before.

The commencement of the action must be preceded by a deposit of 100 lire, which the judicial authority may decide to raise to 500 lire under pain of cessation of the suit.

This deposit in case the demand be completely rejected passes to the body, but with the privilege on the gaining side of repaying the judicial costs.

The admission to gratuitous pleading does not dispense from the deposit.

But as regards matters included under section (*b*) of the preceding article, neither the appeal nor the deposit is necessary, and the deposit alone is necessary in the case of section (*b*, 3).

Art. 84.—The notary or solicitor by whose intervention wills are opened or deposited, through which directly or indirectly institutions are to be founded having the character of public charity, or provisions are contained concerning the foundations of Art. 2 (*b*) of the present law, or by whose intervention acts between living persons are made, concerning similar foundations or dispositions, must, within thirty days of the opening or stipulation, notify it to the syndic.

The violator of this rule is punished by a pecuniary penalty of 10 to 50 lire.

The syndic must transmit to the charity association the copy of the announcement received.

The recorder's office must, on receiving information on the subject, transmit to the steward of finances a list of the legacies mentioned above.

The steward shall every month communicate them to the prefect.

As soon as the charity association shall have received the announcement of donations or legacies for public charity, it must undertake the necessary acts to promote, if necessary, the legal recognition of the body.

Art. 85.—Excepting the penalties established by the penal code against public officials for violation of official duty, and excepting the penalties established by the code itself against anyone else for facts constituting guilt, the following persons shall be punished by a penalty of 100 to 1,000 lire :

(*a*) Anyone who with the intention of eluding the present law shall commit acts or deliver declarations directed to dissimulating the existence or the character of charitable institutions or of institutions contemplated in Arts. 90 and 91 of the present law ; or dissimulates the existence of their goods, titles, and rights ;

(*b*) Whosoever with the same intention gives to a public authority or to administrations of public charity false or incomplete information, or refuses the consignment of documents, registers, books, or papers possessed by him, which are belonging to any of the said institutions or in general of public possessor.

Art. 86.—Those who by the terms of Arts. 17, 78, and 85 of the present law have incurred dismissal from office may not for the term of three years be nominated directing administrators of public charitable institutions.

Art. 87.—The provisions of Chapter VI. of the present law are applicable also to pious foundations or legacies administered by the crown land or by the public worship fund as possessors of lands coming from suppressed religious corporations or suppressed ecclesiastical bodies, either because the corporations and the bodies were heirs of pious founders or only as feoffees in trust.

The bursarships of vacant benefices are also applicable to pious foundations or charitable legacies.

The Minister of the Interior provides for the execution of the same provisions according to Art. 67 with the competent minister, having heard the district provincial councils according to distinctions in Art. 62, the provincial administrative body, and the State Council.

Art. 88.—The application of penalties sanctioned by Arts. 13, 17, 78, 84, and 89 of the present law, belongs to the civil law in council chamber at the instance of the Minister of the Interior.

On the appeal of the person condemned or of the Minister of the Interior, the civil section of the court of appeal in council chamber shall make requisite provisions.

IX.

ON FINAL AND TRANSITORY PROVISIONS.

Art. 89.—The administrators and representatives of charitable institutions, subject to concentration or grouping according to the terms of Chapter VI. of the present law and of those referred to in the following Arts. 90 and 93, must announce the fact to the charity association within fifty days of the publication of the present law.

The infringer of this rule is liable to a monetary penalty of 50 to 100 lire.

The provisions of this article are not applicable to charitable institutions, and legacies, bequests, or pious works of worship administered by the crown, by the fund for worship, or by the general bursarships of vacant benefices, for which must be provided officially within a year of the publication of the law.

Art. 90.—Subject to alteration according to Art. 70 are—

1. The nuns' dowries, according to the effects of the laws for the suppression of religious corporations or of the liquidation of the ecclesiastical assets for the monachal dowries, which were charged with the estates of religious corporations and suppressed religious bodies.

2. The foundations for prisoners and condemned, which shall be converted into foundations of patronage for liberated prisoners, except what is destined to families of prisoners and condemned persons.

3. The homes for catechumens in so far as they preserved their original destination.

Art. 91.—The present laws concerning the ecclesiastical bodies which have been preserved and their donations still being extant, and the suppressions being maintained, and the devolutions ordered by law, they are placed on a footing with public charities and subject to alteration according to the rules in *Art. 70* :—

1. The conservatories which have not the aim of educating youth, homes for pilgrims, the retreats, hermitages, and similar institutions having no social or civil aim ;

2. The fraternities, brotherhoods, congregations, and other similar institutions for which has been verified one of the conditions enunciated in the first part of *Art. 70* ;

3. Pious works of worship, bequests, and legacies for worship excluding those corresponding to a need of the population, and equally excluding those which make part of or may belong to preserved ecclesiastical bodies, to the crown, to the funds for public worship, to the patrons or general bursars of vacant benefices.

When institutions included under the above-mentioned sub-division (2) provide for the necessary worship of a population or buildings necessary to worship or worthy of being preserved, these aims shall be maintained, and it or some other institute in its place shall be continued to be provided for, to which shall be assigned the income corresponding to the expenses of worship.

For collecting the other income of institutes mentioned under sub-head (2) above, the provisions of *Art. 55* of the present law shall be preserved, keeping the provision of *Art. 81* of the law on public safety.

Art. 92.—The declaration of application to *Art. 70*, to the institutes, Nos. 1, 2, 3 of *Art. 90*, is made by ministerial decree, which shall confide the temporary management of the estate, with the obligation of accumulating interests to the local charity association ; and, if several districts or the entire province be interested, to the association of the place in which the institute has its actual seat.

From time to time when the like decrees shall be issued, the charity association, the districts, or the province, according to distinctions of *Art. 62*, must be invited to give their opinion about the destination of the charity according to the rule established by *Art. 70*.

For institutions mentioned in paragraphs (1) and (3) of *Art. 91*, the prefect invites the local representatives indicated in the preceding paragraph to express, within a period to be assigned within the limits of *Art. 63*, their opinion as to the application of *Art. 70* to the various institutions to be designated, and about the eventual destination of the charity according to rules established in the last paragraph of the preceding article.

In both cases the definite provision shall emanate with a royal decree, after the administrative body and the State Council have been heard, and against it appeal is admitted, also for the substance to the fourth section of State Council, with effect of suspension according to *Art. 81*.

Art. 93.—The revision of statutes and regulations has become obligatory :

- (1) Of endowed pious foundations and other charitable institutions in the part concerning the grant of endowment ;
- (2) Of the corn and grain *monti*, and institutions in which after 1862 the said *monti* were transformed.

The prefect shall invite the charity association, the districts or the province, according to the distinctions of Art. 62, to give within three months their opinion as to the appliance of Art. 70, to the eventual destination of the charity or of the reforms which might appear necessary in the statutes.

The said term being passed, and the provincial administrative body and the State Council heard, the transformation of the institute or the reform of the statutes shall be established by royal decree according to rules of preceding articles.

For the bodies mentioned in Section (2) of the present article, the Minister of the Interior must provide in accordance with that of agriculture, industry, and commerce.

The provisions of the last paragraph are applicable to the preceding Article for the definite transformation or reform of the statutes.

Art. 94.—The revision of statutes or regulations is also obligatory of institutions founded for the benefit of people pertaining to provinces or districts differing from the district where the institution has its seat, and the following rules shall be observed :—

(a) If for the small number of persons who may profit by it, or for any other reason, the aim is failing, the institution shall, by the rules in Art. 70, be transformed for the benefit of the populations for whose advantage it was destined ;

(b) So in case the institution be reformed only in its statutes, as in case that the institution should suffer changes also in its aims, a special administration shall be kept, when several provinces or a notable number of districts are interested in the institution ;

(c) When by terms of the present law the transformation of legacies, bequests, and pious works of worship depending on the institution shall have been effected, the corresponding funds shall be united to the estate of the charity for the advantage of those belonging to the provinces and districts for whose benefit the institution was destined.

The application of the rules of the present article takes place in the terms and manner and for the objects indicated in the preceding article.

Art. 95.—Public charitable institutions having no statutes, or internal rules of administration, inventory, or other obligatory acts, must conform to the present law within a year.

Art. 96.—Public charitable institutions must proceed within five years of the publication of the present law, according to titles or existing laws, to the release of bequests, rents, onerous imposts, and other perpetual taxes of any nature with which they may be burdened with the civil obligation duly confirmed.

The administrative body is authorised to concede extension of the mentioned period in cases of recognised convenience.

The acts of release are exempt from stamp, fee, or registration charges.

Art. 97.—In the provinces where by law or custom the obligation of repaying to hospitals the expense of their respective sick poor, such an obligation remains temporarily, but the rules of Chapter VIII. of the present law determine to which district a sick man belongs.

Within three years after the working of this law the king's government shall present to Parliament a report on the working and costs of hospitals, and shall propose legislative measures which it will think opportune.

In the meanwhile the institutes upon whom by Art. 79 it is obligatory to receive the sick, wounded, or women on the point of delivery shall have a right to reimbursement from the district to which the person helped belongs, save when the local charitable association or other institute are bound to relieve the district, and save always the special statutory measures of shelter institutes or special conventions excluding the right of repayment.

Art. 98.—In the cities which have a medical surgical professorship the hospitals are bound to furnish the building and leave the sick and dead bodies needed for the different teaching at their disposal.

The hospitals shall receive an indemnity equivalent to the difference in their expenses for providing necessary service for teaching, and all greater costs caused by this service.

In case of disagreement as to the extension of the obligation of hospitals, as also to their indemnity, three arbitrators shall decide. One shall be named by the representative of the university or institute of higher studies, the other by the hospital administration, and the third by the two arbitrators in common. In case they cannot agree, the third shall be named by the president of the Court of Appeal, at the request of the most diligent party.

The arbitrators shall decide in an amicable arrangement, and their award shall be final, the forms having been observed and the Civil Code complied with.

Art. 99.—Within the term mentioned in Art. 97, the king's government shall propose to Parliament the opportune provisions about the rates imposed on the charities of the southern provinces for subsidies to provincial establishments of the circuit, and to provide pensions to deposed councils of homes.

Art. 100.—With the year 1893, the operation of the dictatorial decree of 9th June, 1860, and of the law 2nd April, 1865, No. 2226, shall cease, as regards bequests exclusively destined to public charity.

The State Treasury preserves fully the right of recuperating arrear credit, from sums anticipated up to 31st December, 1893, to all pious institutions which by the above-named decree and the law of 2nd April, 1865, No. 2226, are held obliged to pay.

The measures contained in the first part of the present article shall not have effect for those institutions which before 1893 have not paid the arrears to which the preceding paragraph refers.

For the said institutions the term of liberation will run from the year in which they shall have extinguished their debt. The credits on the Treasury are condoned which depended on interest on sums anticipated and to be anticipated to those damaged by the Bourbonic troops in Sicily in 1860, as well as credits depending from expenses of administration sustained and to be sustained for the relative thing derogating for such a part as disposed by the said law 2nd April, 1865.

Art. 101.—The bonds in favour of the sufferers mentioned in the royal decree of 21st August, 1862, No. 853, shall be redeemed in 90 years, in equal parts, beginning from 1895 bought at the current price, if below par, or by drawings at or above par to a maximum of 105 per 100 under the law of 8th March, 1874, No. 1834, for the conversion of public debts redeemable by the State, on condition that the amount of premium 5 per cent. to be given in exchange be not more than 90 per cent. of that of the bonds to be withdrawn.

Art. 102.—Every year the Minister of the Interior shall present to the Senate and the House of Deputies a report on the measures of concentration, grouping, and transformation of public charitable institutions, and on the revision of their relative statutes and regulations secured in the past year.

He shall also present a list of the dismissed administrations, showing the motive which determined the dissolution.

Art. 103.—Every Act contrary to the present one is superseded.

The private provisions and conventions which forbid public authorities from exercising over charitable institutions the guardianship or authorised supervision imposed by the present law, and the clauses which on such prohibition make the nullity, fall or reversibility depend, shall be considered as inoperative, and shall have no effect.

This measure also applies to prohibitions and stipulations of nullity, rescission, or reversibility directed to prevent administrative reforms, the change of the aim and the grouping together in Chapter VI. of present law.

Art. 104.—Being the measure of Art. 89, the present law shall be put in force in the periods which shall be established by means of royal decrees, but shall totally be put in force within six months after its promulgation.

Within the same period, royal decrees shall be published, for the execution of the present law and the regulation of the general book-keeping of the institutions subject to it.

We order that this present, furnished with the State seal, be inserted in the official collection of laws and decrees of the Kingdom of Italy, commanding to whomsoever it behoves to observe it, and to make it be observed as a State law.

Given in Rome on 17th July, 1890.

UMBERTO.

CRISPI.

(D.)

ON THE PROVISION OF ISOLATION HOSPITAL
ACCOMMODATION BY LOCAL SANITARY AUTHORITIES.

*Abstract of a Memorandum issued by the Medical Department of the
Local Government Board, London, September 1892.*

Too often the provision of isolation hospitals is put off until some infectious disease is immediately threatening or has actually invaded a district.

The present memorandum is designed to represent to every Sanitary Authority which is without means of isolation for first cases of infectious sickness appearing in its district, the importance of providing itself against that event, and of doing so before the invasion of actual infection.

LARGE VILLAGES and groups of villages commonly require the same sort of provision as towns. Where good roads and proper arrangements for the conveyance of the sick exist, the best arrangement for village populations is by a small building accessible from several villages; otherwise the requisite accommodation for (say) four cases of infectious disease in a village may at times be got in a fairly isolated and otherwise suitable four-room or six-room cottage at the disposal of the Sanitary Authority.

IN TOWNS, hospital accommodation for infectious diseases is wanted more constantly, as well as in larger amount; and it is likely that room will be wanted at the same time for two or more infectious diseases requiring separate treatment. For a town, the hospital provision ought to consist in permanent buildings, with space left for extension, of not less than four rooms in two separate pairs; each pair to receive the sufferers from one infectious disease, men and women of course separately. Considerations of economy point to permanent buildings larger than at first required, so that recourse to temporary extensions may less often be necessary, especially in the case of the administrative offices, as they will be ready to serve, when occasion comes, for the wants of temporary extensions. The plans of the Warwick Joint Hospital, which will be found in the portfolio, illustrate the sanitary requirements of the Local Government Board.

In determining the locality of an infectious hospital, the wholesomeness of the site, the character of the approaches, the facilities for water supply and for slop and refuse removal are matters of primary importance. Small-pox hospitals require a very much larger space about them than other infectious diseases hospitals; they are apt to disseminate small-pox, and they should therefore be placed as far outside towns as considerations of accessibility permit.



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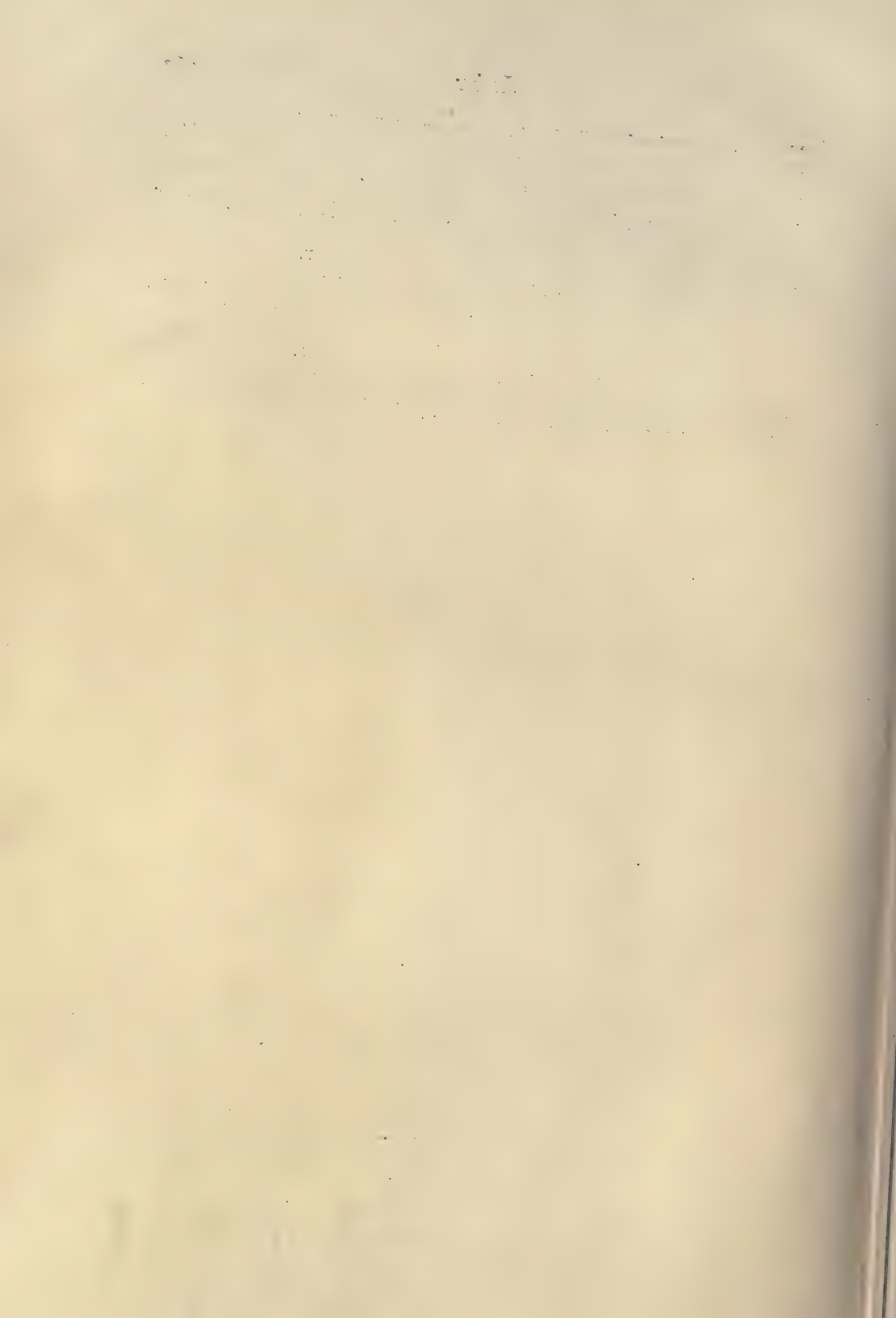
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